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IN THIS ISSUE

THE calorie content of diets of high school students from families of relatively high income is compared with that of diets of students from low-income families in the article entitled "Caloric Intake of High School Students in New York City" by Dorothy G. Wiehl. This report continues the series from an investigation on Medical Evaluation of Nutritional Status. Data are presented on caloric intakes and on estimates of energy requirements based on detailed histories which suggest that most urban high school students do not need as many calories as have been recommended for these ages. Furthermore, variation in calorie need among students is so great that no average requirement can be considered reliable for evaluation of the adequacy of an individual's caloric intake. Students in the high-income group received, on the average, the energy value needed, but those in the low-income group, especially boys, had an average caloric intake below their estimated requirement.

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The successful application of public health procedures which require follow-up of certain individuals and their families is affected by the mobility of persons within the specific population unit. The article "A Study of Mobility Among Tuberculous Households in Upper Harlem" by Sally Preas and Jean Downes describes the flow of population through a group of Negro households in New York City. The amount of moving varied according to the composition of the household, the smallest amount occurring when no persons outside the immediate family were present and the greatest occurring when the household included both relatives other than the immediate family and lodgers.

The factor of migration in the population of Negro tuberculous households is discussed in relation to its importance and effect upon the program for control of the disease among them.

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The *Quarterly* is fortunate in having obtained from the *British Medical Journal* permission to reprint Dr. John A. Ryle's article on the meaning and scope of social medicine. For social medicine is a current topic of considerable interest and it is well to have authoritative views on exactly what is meant by the term. Dr. Ryle emphasizes that social medicine is not to be confused with socialized medicine, nor is it just another name for preventive medicine.

The first Institute of Social Medicine in the United Kingdom was established recently by the University of Oxford, and Dr. Ryle heads that Institute as Professor of Social Medicine. The Institute houses the Oxford Nutrition Survey, plans to establish experimental bureaus for the collection and analysis of morbidity statistics, sponsors some studies of endemic goiter in rural England, and has initiated regular socio-medical teaching and demonstrations for medical students in their clinical years. Its further expansion must await the conclusion of the war.

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The second report in a contemplated series bearing the general title "Social and Psychological Factors Affecting Fertility" appears in this issue. It was prepared by Clyde V. Kiser and P. K. Whelpton and carries the subtitle "Variations in the Size of Completed Families of 6,551 Native-White Couples in Indianapolis." Like the first report, the present one is based upon materials collected during the course of the survey of white families in Indianapolis. This "household survey" was conducted in the summer of 1941 in order to identify couples eligible for a later intensive study of personal and cultural factors affecting human reproduction. The present study deals with distributions of native-white couples of virtually completed fertility (wife 40-44) according to number of live births. The analysis is carried through for Protestant and Catholic couples separately by age of wife at marriage, monthly rental value of the dwelling unit, educational attainment, and birth region of the husband and wife.

MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

XV. CALORIC INTAKE OF HIGH SCHOOL STUDENTS IN NEW YORK CITY

DOROTHY G. WIEHL

DIETARY studies have shown that the calories furnished by the American diet very frequently are considerably below the levels recommended by the National Research Council (1). This is especially evident in studies in which individual food consumption has been recorded. Data from a number of such studies, some of them previously unpublished, have been compiled by the Committee on Diagnosis and Pathology of Nutritional Deficiencies, Food and Nutrition Board of the National Research Council (2). From 30 to 100 per cent of the persons in these studies are reported to have had a caloric intake less than the recommended level for their specific sex and age group; and 5 to 100 per cent are reported to have had less than 75 per cent of the recommended energy values. The average caloric intake reported for various groups also has been found to be so much below the levels recommended that it has been questioned whether the calorie allowances are too high. There is undoubtedly a need for further study of the energy requirements of persons of each sex and age and of the levels of energy expenditure which are most characteristic of various urban and rural groups in our modern period of labor-saving machines.

In the use of recommended allowances for the evaluation of the adequacy of diets, little attention has been given to the expected or normal variation in individual requirements. A number of factors in addition to sex and age, such as body size, type and hours of

[1] This paper is the fifteenth of a series from a cooperative investigation by the Cornell University Medical College, Department of Public Health and Preventive Medicine and Department of Pediatrics; the Milbank Memorial Fund; the New York City Department of Health; and the Division of Public Health Methods, United States Public Health Service.

The cooperating agencies were assisted in carrying out this investigation by the Work Projects Administration for the City of New York.

activity, amount of rest, and climate affect the individual need for calories. Even persons alike as to all these factors differ in their basal energy metabolism. When the only controlled factors in the estimated requirement are sex and age, very large deviations in intake from this requirement must be expected for some individuals and they may have no significance as evidence of an insufficient supply of calories. The more factors affecting energy need that are controlled, the smaller the expected deviations will be; but the sources of individual difference in need are so numerous and the error of estimate for each source is so large that considerable nonsignificant deviation from any estimate of calorie need must be expected. Careful statistical studies have been made of individual variation in basal metabolism and the magnitude of the expected variation in intake for a group due to this factor can be predicted with fair accuracy. But the extent of the variation in individual energy expenditure for various population groups needs to be investigated. For example, in order to evaluate the adequacy of the caloric intake of a group of housewives, not only is an average energy expenditure for such a group needed, but also some measure should be available for the variation in individual needs of such a group.

For two separate groups of high school students in New York City, the individual calorie requirements and the caloric intake have been investigated in considerable detail. In the present report, mean values and the variation in individual values are presented and are considered in relation to other evidence on the adequacy of the caloric intake of the groups.

Description of Data

The Sample. A group of about 300 boys and girls attending Fieldston Ethical Culture School, a private high school in New York City, is used in this report for the more detailed study. These pupils were from families of relatively high income and most of them were of nonorthodox Jewish culture. It is reasonable to assume that consumption was not limited by any shortage of food and that each

child could have eaten as much as he desired. Lunch was served at the school and a complete hot meal was available. The mode of living and level of food consumption should be fairly representative of the economically privileged high school students in New York City and probably of other large urban communities.

Data for nearly 2,000 pupils in Seward Park High School, a public school in New York City, are also presented. This group is from families of low income, some of whom were on relief. About 1,450 pupils in this group were from orthodox Jewish homes, and one or both parents were foreign born except in a very few families; about 300 pupils were of Italian parentage; and another 220 were of other or mixed national origins, including a few of native-born parents.

Both groups have previously been described in other reports (3, 4) in the series from an investigation on Medical Evaluation of Nutritional Status. The methods and scope of the Study have been described (3) and a detailed description of the method of collecting and processing the diet records has been published (4). The survey in Fieldston School was made in March and April, 1940, and in Seward Park from March, 1939, to February, 1940.

Diet Record. Diet histories for a two-day period were collected by the interview method from all Fieldston School pupils and from one half of the Seward Park group. A one-day record was taken from the other half of the Seward Park pupils. To assist the pupil in making estimates of servings of different foods, wax models of measured quantities of several items were displayed on the interviewers' desks, and glasses of different sizes, a typical cup, sauce dish, and bowl were also at hand. These were used as standards of reference, and the pupil was questioned carefully as to how much more or less than a selected sample he had consumed of any food. These high school students were interested and very cooperative, and it is believed that their reports were as accurate as this type of estimate can be.

For all Seward Park pupils, a two-day diet record was obtained from the mother or some other member of the family who was responsible for the meals. This estimate of the food eaten by the pupil during a two-day period was combined with the one or two-day record given by the pupil to obtain an average value for a three or four-day period.

It is recognized that the reported amounts of food are approximations and that in some records the error is probably of considerable magnitude. Nevertheless, the estimate of average daily food consumption is thought to be reasonably accurate for most of the pupils. Individual records will err in both directions, that is, be too high and too low, and average values for groups should provide a representative index of their consumption level.

Each pupil was asked whether the "amount" of food eaten in the two-day period was usual, and if not, to explain the difference.

Activities. A complete history of the pupil's activities during the two days for which the diet record was obtained was recorded by the diet interviewer. This included the hour of retiring and rising; school periods of exercise and type of exercise; time spent in walking or in playing games; travel time to school; time spent listening to the radio, studying, or at the movies, etc.

Physical Measurements. For each boy and girl, height and weight were taken, as well as other measurements not used in this report. Height was taken without shoes, and weight was taken with shoes and outer clothing removed.

Medical History. Pertinent to this report is information obtained on special diets which was obtained as part of the medical history. Several pupils were on diets prescribed by their physicians for some health condition or obesity; and a number reported they were on reducing diets without having had a physician's advice. Pupils in Fieldston School reporting a special or reducing diet, and several who were in bed because of illness on one or both days for which the diet record was taken, have been omitted. Records for eight

boys and twelve girls were excluded for one of the aforementioned reasons. Data for all Seward Park pupils for whom both the pupil and family diet report were available have been included.

Physical Examination. Two physicians, specialists in pediatrics, examined the pupils in Fieldston School and rated them as to their general nutritional condition. Five classes were used, namely: (1) obese, marked; (2) obese, moderate; (3) appears normal; (4) undernourished, moderate; (5) undernourished, marked. In Seward Park, pupils were similarly rated by the two school physicians who assisted with the Study. All four physicians were instructed by the medical director for the Study in order to obtain as much uniformity as possible.

Method of Estimating Calorie Requirements

Basal metabolic need for calories was estimated for each pupil from a table by Boothby, Berkson, and Dunn (5) giving average requirements per hour by sex, age, and surface area. The square meters of surface area were estimated from a chart published by Dubois (6) for surface area from height and weight measurements.

From a pupil's report on time devoted to various pursuits during the period for which the diet was recorded, additional calorie needs were estimated at four levels of energy expenditure. Requirements for sedentary hours, such as mealtime and classroom periods, were placed at 40 per cent more than basal; for light exercise, such as dressing, walking, and housework, at 150 per cent more than basal; for moderate exercise, such as gymnastics, playing baseball or handball, and working after school as delivery boy, etc., at 280 per cent; and for severe exercise, such as football, basketball, and dancing, at 600 per cent more than basal. The hours of severe exercise were conservatively estimated as a part of the time spent on the football field or at a dance. Energy metabolism during hours of sleep was taken as 88 per cent of basal. To the total estimated energy expenditure there was added 13 per cent of this total to allow for diges-

tive waste and growth. These values were derived mainly from Bedale (7).

A sample calculation of the calorie requirement per day from a two-day record for a 16-year-old boy is as follows:

	Calories
Basal for 48 hours at 77.3 per hour	3,710
Sleep 17.5 hours, 17.5 x 77.3 x .12	−162
Sedentary 23.6 hours, 23.6 x 77.3 x .4	730
Light exercise 5.8 hours, 5.8 x 77.3 x 1.5	672
Moderate exercise 1.1 hours, 1.1 x 77.3 x 2.8	238
Total energy expenditure, two days	5,188
Total per day	2,594
Total plus 13 per cent for growth and waste	2,931

This boy was almost exactly of average height and weight, being 68 inches tall and weighing 138 pounds. His energy requirement is estimated at slightly less than 3,000 calories per day. However, it will be noted that he had little exercise, and for three-fourths of his waking hours he was sitting. He reported his activities as follows: attended school from 9 to 5 o'clock and had one exercise period in the two days; traveled by subway about one hour and walked twenty-five minutes each day; studied or read for about five hours at home in the two days; and spent the remainder of the time eating, dressing, and "just talking." This boy is fairly typical of the private school pupils.

The hours spent at different grades of activity are shown in Table 1 for the boys and girls in Fieldston School and for about 600 pupils in Seward Park High School. Since reports for Saturdays and Sundays are included, there were some pupils with a relatively large amount of exercise, and some with more hours of sleep than is usual at this age.

Among the private school group, 64 per cent of the boys and 54 per cent of the girls had over two but not more than four hours a day of light exercise, mostly dressing or walking and similar light

Table 1. Number of hours per day allotted to sleep and activities classified at four levels for boys and girls in a public and private high school in New York City.

Hours Daily	Per Cent of Total			
	Private School		Public School	
	Boys	Girls	Boys	Girls
Number of Pupils	176	167	295	298
Sleep:				
Total	100.0	100.0	100.0	100.0
6.00– 7.50	1.7	2.4	7.1	3.7
7.51– 8.50	14.2	18.6	19.3	25.8
8.51– 9.50	48.3	47.3	45.8	48.3
9.51–10.50	30.7	26.3	21.7	19.8
10.51–12.00	5.1	5.4	6.1	2.3
Sitting:				
Total	100.0	100.0	100.0	100.0
2.8– 5.0	0	0.6	4.4	3.4
5.1– 6.0	0	1.2	9.5	5.0
6.1– 7.0	1.7	1.8	12.5	8.7
7.1– 8.0	2.3	1.8	14.2	11.7
8.1– 9.0	10.8	11.4	23.4	25.8
9.1–10.0	21.6	21.6	21.0	20.5
10.1–11.0	29.0	26.3	11.2	16.8
11.1–12.0	26.1	21.6	3.1	7.0
12.1–15.0	8.5	13.8	0.7	1.0
Light Exercise:				
Total	100.0	100.0	100.0	100.0
1.1– 2.0	11.9	6.0	1.4	0.3
2.1– 3.0	33.5	24.0	8.5	2.7
3.1– 4.0	30.7	29.9	26.1	15.8
4.1– 5.0	18.2	21.6	23.4	25.5
5.1– 6.0	3.4	9.6	18.6	25.2
6.1– 7.0	0	7.2	8.8	15.4
7.1– 8.0	1.7	1.2	8.5	8.7
8.1–11.0	0.6	0.6	4.7	6.4
Moderate Exercise:				
Total	100.0	100.0	100.0	100.0
None	14.2	42.5	11.5	22.8
0.1–1.0	51.1	38.9	43.7	58.7
1.1–2.0	28.4	18.0	27.1	13.4
2.1–3.0	5.7	0.6	8.8	3.4
3.1–4.0	0.6	0	5.1	1.0
4.1–8.3	0	0	3.7	0.6
Severe Exercise:				
Total	100.0	100.0	100.0	100.0
None	90.9	89.2	38.6	69.5
0.1–1.0	8.5	10.8	49.8	28.5
1.1–2.0	0.6	0	10.5	2.0
2.1–3.0	0	0	1.0	0

activity. About 19 per cent of the girls had more than five hours of light exercise per day as compared with 6 per cent of the boys, but this difference is explained by the fact that more of the boys had some moderately strenuous exercise. It is evident from this tabulation that these high school pupils, on the average, were not very active.

The public school boys and girls were more active in their out-of-school hours and had fewer hours of sleep than the private school pupils. In the public school group, 35 per cent of the boys and 44 per cent of the girls spent nine to twelve hours daily in sedentary pursuits compared with 77 per cent of the boys and 70 per cent of the girls in the private school group. A larger amount of moderate and severe exercise was reported by the public school pupils.

Error of Estimates of Energy Expenditure. Methods for measuring energy output have long been available and careful studies have been made in the past fifty years of basal metabolism and of heat (energy) production in the performance of various types of muscular effort. If an individual's basal metabolism is known, and a detailed record of all activity is available, estimates of energy expenditure can be very accurate. But when estimates make use of average values, as in this Study and in most surveys, the error may be large. The major sources of errors in the estimates in this Study are individual differences in basal metabolism and the use of only four levels of energy output for the many different types of activities. Some error in the estimate of total energy need arises also from errors in estimating body size and from the allowance of a constant 13 per cent for growth and waste for all ages from 11 to 19 inclusive.

Data on individual variation in basal metabolism (mean calories per square meter per hour) are available (5) for the group from which the Mayo Foundation averages used in this Study were derived.[3] At ages 11 to 19 years, the standard deviation for boys

[3] There is no agreement on the correct or best standard for basal metabolism during adolescence. The Mayo Foundation values used are higher than a number of others. A study

(Continued on page 13)

varied from 6.4 to 7.0 per cent of the mean, and for girls it varied from 6.4 to 7.3 per cent. Thus, there is approximately one chance in twenty that the true basal energy need of an individual boy or girl would be more than 13 per cent greater or less than the estimated level. Obviously, this means that there is considerable variation in the calorie level which will be adequate to meet energy requirements of a specific individual even after account is taken of sex, age, height, and weight.

The magnitude of the errors in the allowances made for energy expended in muscular effort and for growth is, of course, unknown. It is probably conservative to assume that errors from these sources are large enough to increase the standard deviation, or error of estimate, for individual estimates of total daily calorie requirements to about 14 per cent.

Estimated Calorie Requirements

The minimum and maximum estimated individual requirements for boys and girls of each age in the private school and in the public school are shown in Table 2. The range is consistently greater for the public school pupils than for those in the private school, since among the former group there were some with a relatively large amount of moderately severe exercise. In the private school group, the difference between the maximum and minimum requirement for boys of a specific age is as much as 2,000 calories daily, and for girls, the greatest difference is 1,400 calories. In the public school group, there is a spread in the range of 3,200 calories for boys and

by Webster, Harrington, and Wright (8) of thirteen boys and eight girls, most of whom were observed from ages 11 to 16 years, gives mean values for calories per square meter per hour very close to those obtained at the Mayo Foundation for boys and girls aged 11 years, but from 12 to 16 years the mean values are from 5.5 to 7.5 per cent lower than the Mayo standards. Basal metabolism values have been compiled by Rose from several sources and published by Sherman (9). A range with no mean value is given by Rose for boys aged 12 to 14 years and for girls aged 11 to 16 years, and the mid-value of the range is compared with the Mayo standards. For boys aged 12, the Rose standard is 4 per cent lower and from 15 to 18 years, it agrees closely with the Mayo standard, but at ages 11, 13, and 14 years it is from 7 to 18 per cent lower. For girls, the Rose standards (mid-values) range from about 6 per cent lower at 14 years to 18 per cent at 16 years. Such differences in standard values emphasize the necessarily approximate nature of individual requirement levels derived from some average rather than from measurement of individual basal rates.

Table 2. Daily calorie requirements estimated from surface area and reported activity according to sex and age for boys and girls in a private and a public high school in New York City.

Age	Number	Estimated Calories Needed Daily				Requirement = or + N.R.C. Allowance	
		Mean	S.D.[1]	C.V.[2]	Range (100's)	Number	Per Cent
	PRIVATE SCHOOL—BOYS						
11–12	27	2,576	257	10	22–33	15	55.6
13	38	2,729	389	14	21–41	4	10.5
14	29	2,888	241	8	23–34	4	13.8
15	26	3,023	309	10	25–35	8	30.8
16	28	3,129	304	10	26–37	0	0
17	16	3,181	391	12	26–37	0	0
	PRIVATE SCHOOL—GIRLS						
11–12	26	2,412	268	11	18–28	10	38.5
13	24	2,367	250	11	19–29	1	4.2
14	23	2,372	217	9	20–28	0	0
15	29	2,329	226	10	19–30	1	3.4
16	29	2,333	284	12	18–32	11	37.9
17	23	2,320	284	12	19–30	7	30.4
	PUBLIC SCHOOL—BOYS						
13	22	2,932	372	13	22–36	5	22.7
14	135	3,148	497	16	18–47	56	41.5
15	247	3,325	511	15	20–51	136	55.1
16	334	3,381	515	15	20–52	55	16.5
17	258	3,407	555	16	23–53	51	19.8
18	97	3,317	518	16	22–45	16	16.5
	PUBLIC SCHOOL—GIRLS						
13	25	2,486	359	14	18–32	6	24.0
14	117	2,557	387	15	18–41	26	22.2
15	291	2,485	319	13	18–37	47	16.2
16	300	2,414	300	12	18–36	137	45.7
17	156	2,347	295	13	18–33	59	37.8
18	40	2,373	450	19	18–38	14	35.0

[1] Standard Deviation.

[2] Coefficient of Variation, or $\frac{SD}{mean} \times 100$.

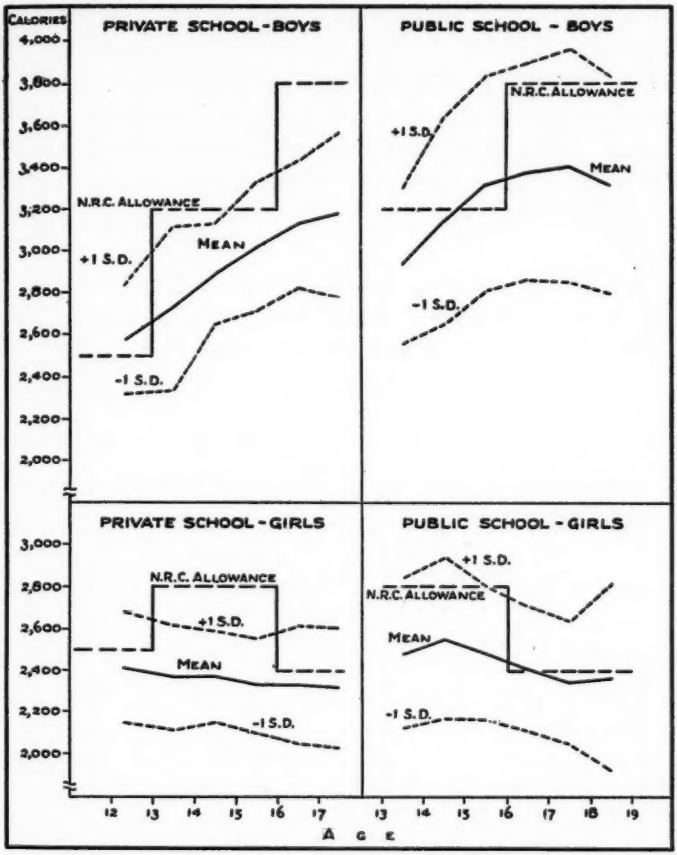

Fig. 1. Estimated mean daily requirement for calories and limits of plus and minus one standard deviation of the distribution of individual requirements at single years of age for boys and girls in a private and in a public high school in New York City compared with daily allowances recommended by the National Research Council.

2,300 calories for girls. With differences of this magnitude in individual energy need, it is obviously impossible to evaluate the adequacy of caloric intake in terms of its relation to an average or standard allowance.

The mean calorie need for girls changed very little with age, as may be seen in Figure 1 and Table 2. In this, it differs from the recommended allowances which are 2,800 calories at ages 13-15 years and 2,400 calories from 16 to 20 years. The lower level, 2,400 calories, is fairly close to the mean requirements estimated in this Study which varied from 2,320 for girls 17 years old in the private school to 2,557 for those aged 14 years attending the public school.

For boys, there is a steady increase with age in the mean estimated daily requirement for both private and public school groups, but, at each age, the mean for the public school boys is from 200 to 300 calories higher than the mean for private school boys of corresponding age.

The maximum mean daily calorie need in the Study is for public school boys aged 17 years and is 400 calories less than the recommended allowances of 3,800 calories, but at ages 13 to 15 years, the Study averages for the public school group vary from nearly 300 calories less than the recommended allowance to 125 calories more. Estimated mean energy levels for the private school boys are from about 200 to 700 calories less than recommended allowances for corresponding ages, except at ages 11-12 for which the Study mean is slightly higher.

The high calorie allowances recommended for girls aged 13 to 15 years and for boys aged 16 to 18 years are not borne out by the data on activity and body size for these groups. Furthermore, as will be shown, the caloric intake at different ages did not follow the pattern of the recommended allowances.

Caloric Intake of Private School Group

For the diet records of all boys and girls in the private school, including those reported as not typical, the average caloric intake daily by sex and at each year of age is shown in Table 3. For boys, the intake falls into three levels of approximately 2,400, 2,900, and

Age	Boys		Girls	
	Number	Calories Mean Daily	Number	Calories Mean Daily
11	4	2,478	5	2,139
12	23	2,358	21	2,157
13	38	2,863	24	2,031
14	29	2,908	23	2,155
15	26	2,956	29	2,386
16	28	3,204	29	2,133
17	16	3,247	23	2,088
18	7	3,053	2	2,019

Table 3. Mean caloric intake per day at each age reported by boys and girls at Fieldston School.

3,200 calories for ages 11-12,* 13-15, and 16-18 years, respectively. For girls, differences in the average number of calories by age are relatively small and follow no consistent trend or pattern. Since the number of pupils at each age is small, ages have been grouped for further analysis of the diets.

In Table 4, only diet records reported as "usual" have been included. In addition to the mean and median number of calories daily for sex-age groups, the ranges and standard deviations of the distributions are shown. The exclusion of nontypical food records had little effect on the average calories for most age groups, but for girls aged 16-18 years the mean number of calories was increased considerably. Most of the excluded records were for Saturday and Sunday, and many of the older girls and some of the boys had eaten irregularly. Some of them ate no breakfast, others missed lunch or had no evening meal on Sunday. On the other hand, there were some who ate "unusually" large amounts of food on one or both days.

When the unusual diet records are excluded, the mean intake for girls 11-13 years of age is 2,140 calories, for ages 14-15 is 2,295 calories, and for ages 16-18 is 2,294 calories. The difference in intake

*The 11-year-old boys and girls included were more than 11 years and 9 months with the exception of one girl aged 11 years and 5 months.

Sex and Age Group	Number	Mean Calories and Standard Error	S. D.	C. V.	Median	Range
Boys—All Ages	153	2,922 ± 61	750	26	2,806	
11–12 Years	26	2,438 ± 117	598	25	2,352	1,358–4,050
13 Years	35	2,860 ± 126	746	26	2,790	1,640–4,895
14–15 Years	49	2,949 ± 104	727	25	2,840	1,327–4,520
16–18 Years	43	3,235 ± 110	721	22	3,228	1,830–4,987
Girls—All Ages	119	2,243 ± 49	538	24	2,170	
11–13 Years	40	2,140 ± 66	420	20	2,078	1,345–3,158
14–15 Years	43	2,295 ± 96	630	27	2,212	1,120–3,827
16–18 Years	36	2,294 ± 78	532	23	2,255	1,445–3,585

Probability of observed differences in means by age occurring by chance:
Boys, $P < .01$ Girls, $P > .05$

Table 4. Estimated calories per day in two-day "usual" diets reported by boys and girls in a private high school in New York City, March-April, 1940.

by age is not significant in a statistical sense because of the great variation in the calories in individual diets and the small numbers of girls in each age group. The median calorie value for each age group is 60 to 90 calories lower than the mean number of calories. The range in energy value of the diets is very great, 1,120 to 3,827 calories,[4] and is greater than the range for estimated need, but since the caloric intake and estimated requirement are both subject to error, this is to be expected. Although reported as typical diets, variation in caloric content from day to day is no doubt considerable and the extreme values probably represent low-calorie or high-calorie diets rather than the true average intake for the individuals over a longer period.

For boys, the differences among mean calories per day, by age groups, are significant statistically. There is a steady increase with

[4] The range in energy value for these two-day diets is not unusual. For example, from a recent study (10) of twenty-seven college women, in which mean daily caloric intake was determined for weighed, analyzed diets over a seven-day period, the range reported is 1,191 to 3,267 calories and the mean is 2,038 calories.

age, the energy value of diets for boys 16-18 years being on the average about one-third higher than for boys 11-12 years old. The mean daily calories by age were: 2,438 for ages 11-12 years, 2,860 at age 13, 2,949 at ages 14-15, and 3,235 for ages 16-18 years. The median caloric intake is again somewhat lower than the mean. Individual variation at each age is very great and the range wider than that found for girls, the lowest intake being 1,327 and the highest 4,987 calories. The coefficients of variation, however, show that the variation relative to the means was similar for boys and girls.

Relation of Intake to Need. In order to compare individual intake with estimated energy expenditure, the calories in each pupil's diet are expressed as a percentage of his estimated requirement. For brevity, this percentage is termed calorie-per cent. The distributions of these calorie-per cents, averages, and other measures are given in Table 5.

On the average, boys of all ages had 103 per cent of their energy

Table 5. Caloric intake as percentage of estimated individual calorie requirement for boys and girls in a private high school in New York City who stated diet records for two days were typical.

Percentage of Estimated Energy Need	Number of Boys					Number of Girls			
	Total	Age Group				Total	Age Group		
		11–12	13	14–15	16–18		11–13	14–15	16–18
Total	153	26	35	49	43	119	40	43	36
49.9 or Less	1			1		1		1	
50.0– 69.9	13	3	3	4	3	16	7	5	4
70.0– 89.9	41	10	9	14	8	34	11	10	13
90.0–109.9	42	8	9	14	11	38	16	15	7
110.0–129.9	29	3	6	7	13	15	3	7	5
130.0–149.9	18	1	5	5	7	14	3	4	7
150.0–169.9	6	1		4	1	1		1	
170.0–189.9	2		2						
195	1		1						
Mean Per Cent	103.3	93.5	108.4	100.9	107.8	96.3	92.0	98.5	98.6
Stan. Error of Mean	2.24	4.43	5.53	3.89	3.86	2.26	3.25	4.13	4.29
Stan. Deviation	27.6	22.6	32.7	27.2	25.3	24.6	20.5	27.1	25.8
Coeff. of Variation	27	24	30	27	23	26	22	27	26

needs and girls had 96 per cent. Thus, the average caloric intake approximately equalled the average need for each sex. The difference between the boys and girls is, however, moderately significant, since a difference as great as 7 per cent in the mean percentages has a probability (t test) of only .04. The mean percentage of energy need furnished by the diets was consistently lower for girls than for boys at each age, but the difference is relatively large at ages 13 and 16 to 18 years.

For each sex, the youngest age group had on the average the least adequate intake of calories. Among boys, only those aged 11-12 years had a mean calorie-per cent less than 100. However, for neither boys nor girls was the variation among means of calorie-per cents for the different age groups statistically significant. The mean calorie-per cent of 92 for girls aged 11-13 years is significantly less than 100. Other evidence discussed in a later section suggests that the low calorie-per cents for both boys and girls in the youngest age group are the result of insufficient food consumption rather than of an overestimate of need for some pupils.

For individual boys and girls, the calorie-per cents differ widely as shown by the distributions in Table 5. Only 27 per cent of the boys and 32 per cent of the girls of all ages are found to have from 90 to 109 per cent of their estimated energy expenditure during the two-day period; but 73 per cent of each sex had from 70 to 129 per cent of their energy need.

The significance of low and high calorie-per cents in the distributions shown in Table 5 should be judged in relation to the variation to be expected from the errors of estimates for the various factors which entered into the derived calorie-per cents. For the most part, these errors are unknown, but the use of assumed values is helpful, if only to illustrate the difficulty of selecting the deficient diets. For estimated individual energy requirement, an expected standard deviation from errors of estimate of 14 per cent has already been discussed (page 13). The calorie content of the diet is

the other factor in the quotient, calorie-per cent, and also has an error of estimate which arises both from faulty reporting and from errors in estimating calories in the reported diet. A standard deviation of error equal to 10 per cent of the calculated calorie content seems conservative. On the basis of these two errors of estimate, the standard deviation for the individual calorie-per cent determinations is 17 per cent,[5] and only values which are 35 per cent less or more than 100 would have, in a statistical sense, a significantly high probability that the calorie intake was less or greater than energy expenditure for reasons other than accidental errors. Furthermore, because of the error of each calorie-per cent, some diets for which the calorie-per cent differs only slightly from 100 would really be out of balance. Regardless of the accuracy of these assumed errors, it is apparent that only markedly deficient diets can be identified.

With errors of the assumed magnitude for calorie content and estimated calorie requirement, the expected distribution of calorie-per cents would have a standard deviation of 17 if all diets were in fact adequate for the individual. The observed standard deviation for calorie-per cents, in Table 5, is 28 for boys and 25 for girls, indicating a considerably wider spread in the distribution than is accounted for by these assumed errors. The "expected" proportion of each group with calorie-per cents 130 or above and less than 70 is 4 per cent. Among boys, the frequency of calorie-per cents 130 or above is 18 per cent of the total and less than 70 is 9 per cent of the total. Among girls, those with calorie-per cents of 130 or above were 13 per cent of the total and with calorie-per cents of less than

[5] The standard deviation for a quotient (11) is:

$$\sigma_{x_1/x_2} = \frac{x_1}{x_2} \sqrt{v_1 + v_2 - 2\, r_{1.2}\, v_1 v_2}$$

and v is the standard deviation divided by the mean.

Since there should be no correlation between the error in estimating energy requirements and the error in calorie content of the diet, the r factor in the formula can be omitted. The mean calorie requirement and the mean calorie content of diets should be equal, so the standard deviation for errors in estimating the calorie-per cent becomes:

$$\sigma = 1 \quad \sqrt{.14^2 + .10^2} = .172$$

70 were 14 per cent of the total. Unless the errors were much larger than has been assumed, there were both boys and girls in this high-income group on diets that were too high and too low in calories.

Relation of Intake to Basal Energy. It is of interest to examine the ratio of caloric intake to basal energy for these boys and girls, since it is frequently not feasible to obtain detailed information on amount and type of activity, although height and weight may be known. The percentages of basal energy furnished by the diets are shown in Table 6. For girls, the mean percentage was 55 per cent above basal and for boys it was 69 per cent, and the difference is statistically very significant ($P<.01$). Some difference by age is shown for each sex, but for neither sex is the variation among age means significant.

Table 6. Caloric intake as percentage of estimated basal energy for individual boys and girls in a private high school in New York City who stated diet records for two days were typical.

Percentage of Basal Energy	Number of Boys					Number of Girls			
	Total	Age Group				Total	Age Group		
		11–12	13	14–15	16–18		11–13	14–15	16–18
Total	153	26	35	49	43	119	40	43	36
67	1			1		1		1	
80– 99	2	1		0	1	6	1	5	
100–119	19	5	3	8	3	14	7	1	6
120–139	17	1	4	7	5	17	5	7	5
140–159	35	9	9	10	7	36	16	9	11
160–179	26	5	8	6	7	17	7	8	2
180–199	17	2	1	5	9	11	1	5	5
200–219	13	2	2	5	4	11	2	4	5
220–239	11		4	3	4	4	1	2	1
240–259	9		2	4	3	2		1	1
260–279	1	1							
280–299	1		1						
337	1		1						
Mean Per Cent	168.8	155.0	177.4	164.7	174.9	155.0	148.3	157.0	160.3
Stan. Error of Mean	3.65	7.79	8.68	6.47	6.33	3.20	4.63	6.32	6.24
Stan. Deviation	45.1	39.7	51.4	45.3	41.5	36.5	29.3	41.4	37.4
Coeff. of Variation	27	26	29	27	24	23	20	26	23

Individual variation is large for caloric intake in excess of basal energy, but the coefficients of variation (standard deviation as a percentage of the mean) are of the same magnitude as found for the distributions of percentages of estimated total calorie need furnished by the diets. This suggests that for some of these high school pupils the amount of exercise played a minor part in determining the caloric intake, especially for the more extreme dietary levels. If a consistent relationship existed between amount of muscular activity and caloric intake above basal need, a lower coefficient of variation for calorie-per cents than for ratio of caloric intake to basal would be expected.

To some extent, the frequency of deficient diets is shown by the prevalence of low percentages of basal energy, since even sedentary pupils would require a caloric intake about 40 per cent above basal need. The degree of the deficiency, however, is less well indicated than when total requirement is estimated, and an insufficient diet for the more active child is not revealed. Little information is furnished concerning excessive consumption of calories by a high ratio of calories to basal need, since the upper limit of calorie need is completely dependent on the amount of exercise.

It will be noted that a few children reported diets with less calories than the estimated basal energy. An actual intake below basal need is very unlikely, but a ratio less than 1.0 may be expected occasionally as a result of the error of estimate for basal energy and for the calorie content of a diet, and of day-to-day variation in intake.

Relation of Weight to Caloric Intake

Since an imbalance between the consumption of calories and energy requirements produces a gain or loss in weight, the relationship between weight and the reported diets has been examined for the private school pupils. The weight recorded in the Study examination for each child was compared with the Baldwin-Wood

standard weight for height and age, after adjustment of the latter for weight of clothing. The distributions of the percentage deviations from this standard are shown in Table 7. Both boys and girls tend to be heavier than this standard weight, and 26 per cent of the boys and 23 per cent of the girls were 15 per cent or more above their weight standard. Only 1 per cent of the boys and 2 per cent of the girls were 15 per cent below their weight standard, but 6 and 11 per cent, respectively, were from 7.5 to 15 per cent underweight. Some differences by age in the proportions overweight and underweight may be mentioned. At ages 11-12 years, 48 per cent of the boys were 15 per cent or more above standard weight, and the corresponding percentage declined to 12 per cent at ages 14 and 15 years, then increased again to 24 per cent in the older ages. There is little difference by age in the proportion of boys who were 7.5 per cent or more underweight. Among girls the trend toward excess weight is similar to that for boys. Of those aged 11-12 years,

Table 7. Weight of boys and girls in a private school in relation to Baldwin-Wood standard weight for sex, age, and height.

Sex and Age	Number	Per Cent in Specified Weight Group					
		Total	Percentage Over Standard			Percentage Under Standard	
			15.0+	7.5–14.9	0–7.4	0.1–7.4	7.5–14.9	15.0+
Boys—Total	179	100.0	26.3	14.5	28.5	23.5	6.1	1.1
11–12 Years	29	100.0	48.3	10.3	13.8	20.7	3.4	3.4
13 Years	39	100.0	33.3	12.8	30.8	17.9	5.1	0
14–15 Years	58	100.0	12.1	17.2	36.2	25.9	6.9	1.7
16–18 Years	53	100.0	24.5	15.1	26.4	26.4	7.5	0
Girls—Total	168	100.0	23.2	17.3	31.0	15.5	11.3	1.8
11–12 Years	27	100.0	29.6	3.7	22.2	14.8	29.6	0
13 Years	24	100.0	25.0	20.8	37.5	8.3	4.2	4.2
14–15 Years	56	100.0	17.9	19.6	33.9	16.1	8.9	3.6
16–18 Years	61	100.0	24.6	19.7	29.5	18.0	8.2	0

30 per cent were 15 per cent or more overweight, the proportion declined to 18 per cent at ages 14-15 and increased to 25 per cent at 16 years or older. The proportions underweight among girls show a sharp difference with age, and 30 per cent of those aged 11-12 years were 7.5 per cent or more underweight, but at older ages only 8 to 12 per cent of the girls were as much as 7.5 per cent underweight.

It may be questioned whether the Baldwin-Wood standard weight table for American boys and girls is applicable to this Jewish group. The physicians' rating on nutritional status are shown in Table 8 according to three classifications, namely, (1) obese, moderate or marked; (2) normal; and (3) undernourished, moderate or marked. About 12 per cent of the boys and 14 per cent of the girls were rated obese, and although these proportions are roughly half as great as the proportions 15 per cent overweight, it is evident that many in the group were too fat and the excess weight is not explained on the basis of body build. The physicians considered 11 per cent of the boys and 5 per cent of the girls undernourished to some degree, as compared with 7 per cent of the boys and 13 per cent of the girls found to be 7.5 per cent or more

Table 8. Physicians' ratings on nutritional status of boys and girls in a private school in New York City.

Sex and Age	Number	Per Cent with Specified Rating			
		Total	Obese	Normal	Under-Nourished
Boys—Total	179	100.0	11.7	77.7	10.6
11–12 Years	29	100.0	27.6	51.7	20.7
13 Years	39	100.0	15.4	74.4	10.3
14–15 Years	58	100.0	3.4	87.9	8.6
16–18 Years	53	100.0	9.4	83.0	7.5
Girls—Total	168	100.0	14.3	80.4	5.4
11–12 Years	27	100.0	11.1	70.4	18.5
13 Years	24	100.0	8.3	87.5	4.2
14–15 Years	56	100.0	14.3	80.4	5.4
16–18 Years	61	100.0	18.0	82.0	0

below the standard weight. Weight was well correlated with the physicians' rating of obesity, and the boys, with one exception, who were rated obese were 15 per cent or more overweight. The obese girls varied more in the percentage of excess weight and were distributed over the range of 7 per cent or more overweight. The rating of "undernourished," however, correlated poorly with weight, and other factors apparently had more influence on the physicians' appraisal. Two boys and two girls rated as undernourished were above their standard weights, and one girl who was 18 per cent underweight was not rated as undernourished. For correlation with caloric intake, the Baldwin-Wood standard weights seem to afford a satisfactory base for classifying the weight status of these pupils.

When a direct comparison is made between weight status of the individual and the calorie level of his diet, a positive correlation, which presumably should be expected, is not found. The distributions according to calorie-per cent for boys and girls in each weight

Table 9. Percentage deviation of weight from standard weights for sex, age, and height and caloric intake as percentage of estimated individual requirement for boys and girls of all ages in a private high school in New York City.

Percentage + or − Standard Weight	Number	Per Cent of Pupils with Caloric Intake Specified Percentage of Need						
		Total	69.9 or Less	70.0–84.9	85.0–99.9	100.0–114.9	115.0–129.9	130.0 or More
Boys—Total	153	100.0	9.2	23.5	19.6	18.3	11.8	17.7
+15.0 or More	36	100.0	22.2	36.1	16.7	13.9	2.8	8.3
+ 7.5–14.9	22	100.0	9.1	22.7	22.7	18.2	13.6	13.6
+ 0.0– 7.4	47	100.0	6.4	19.1	17.0	21.3	14.9	21.3
− 0.1– 7.4	35	100.0	0	20.0	20.0	22.9	11.4	25.7
− 7.5 or More	13	100.0	7.7	15.4	30.8	7.7	23.1	15.4
Girls—Total	119	100.0	14.3	17.6	29.4	16.8	9.2	12.6
+15.0 or More	24	100.0	29.2	25.0	33.3	4.2	4.2	4.2
+ 7.5–14.9	17	100.0	0	35.3	41.2	5.9	11.8	5.9
+ 0.0– 7.4	41	100.0	17.1	19.5	19.5	24.4	9.8	9.8
− 0.1– 7.4	21	100.0	9.5	0	42.9	19.0	0	28.6
− 7.5 or More	16	100.0	6.3	6.3	18.7	25.0	25.0	18.7

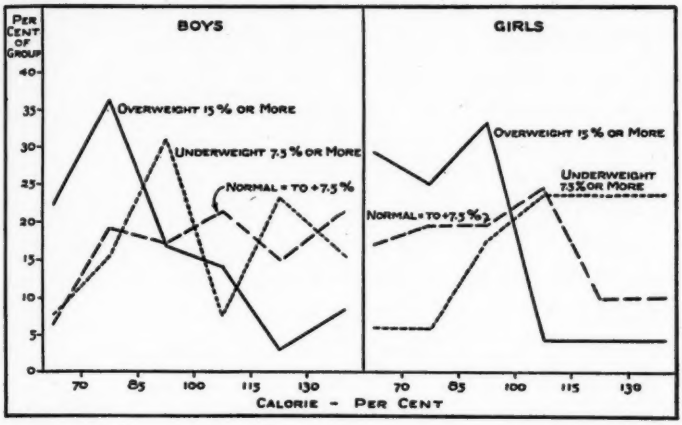

Fig. 2. Percentage distribution of diets according to per cent of calorie need furnished for pupils in a private high school whose weight deviated various per cents from the Baldwin-Wood age-height standard.

status group are shown in Table 9, and three groups are shown in Figure 2. It is apparent that both underweight and overweight pupils reported diets of both low and high calorie-per cent. There is, however, a rather definite *inverse* relationship between weight status and calorie-per cent. Thus, among those 15 per cent or more overweight, 22 per cent of the boys and 29 per cent of the girls received less than 70 per cent of their estimated energy need and only 8 and 4 per cent of them, respectively, received 130 per cent or more of their energy need. A similar inverse association is shown for those underweight 7.5 per cent or more: 8 per cent of the boys and 6 per cent of the girls had diets furnishing less than 70 per cent of the calories needed, but 15 and 19 per cent of them had diets with 130 per cent or more of calories needed to balance their estimated energy expenditure. The intermediate weight groups also tend to follow the same pattern, and the lower calorie-per cent diets increase in frequency as weight increases and vice versa.

Since obesity increases surface area and therefore the basal energy value and total requirement estimate, and thinness does the

reverse, this has a tendency to overemphasize the difference in actual requirement. A further tabulation is presented, therefore, which shows the distributions of boys and girls according to the calories consumed daily per inch of height. While calories per inch eliminates the effect of extremes of weight, there is no adjustment for need as the result of amount of physical exercise. In Table 10, it is shown that calories per inch also have a tendency to vary inversely with weight. The proportion of those markedly overweight who had a low intake of calories per inch is higher than the proportion of the underweight group, and, inversely, the proportion with a high intake of calories per inch is higher for the underweight group than for the overweight group.

There is no direct evidence to interpret and explain the finding

Table 10. Percentage deviation of weight from standard weight for sex, age, and height and caloric intake per inch of height for boys and girls of all ages in a private school in New York City.

Calories Daily per Inch of Height	Per Cent of Pupils in Each Weight Class with Specified Calories					
	Total	Weight Class—Percentage Deviation from Standard				
		+15.0 or More	+14.9 to +7.5	+7.4 to +0	−0.1 to −7.4	−7.5 or More
Boys—Number	153	36	22	47	35	13
All Intakes	100.0	100.0	100.0	100.0	100.0	100.0
33 or Less	12.4	22.2	13.6	8.5	5.7	15.4
34–41	34.0	44.4	27.3	29.8	34.3	30.8
42–49	26.1	19.4	31.8	27.7	25.7	30.8
50–57	15.0	5.6	13.6	19.1	20.0	15.4
58 or More	12.4	8.3	13.6	14.9	14.3	7.7
Girls—Number	119	24	17	41	21	16
All Intakes	100.0	100.0	100.0	100.0	100.0	100.0
26 or Less	13.4	25 0	0	17.1	9.5	6.3
27–32	22.7	20.8	41.2	22.0	14.3	18.8
33–38	31.9	29.2	35.3	26.8	42.9	31.2
39–44	18.5	12.5	11.8	24.4	9.5	31.2
45 or More	13.4	12.5	11.8	9.8	23.8	12.5

of an inverse relationship between calories and weight, but it is believed that three factors were operating to cause it. One important factor is that the adolescent boy and girl become "weight conscious" and those overweight seek to reduce or to control their weight. This interest in slimness on the part of young women is well known and is further supported by the fact that seven of the thirty-nine girls 15 per cent or more overweight reported they were reducing. Only two boys, 12 and 13 years old, reported reducing diets. The majority of both boys and girls reporting "unusual" diets were above normal weight and had eaten very low-calorie diets in the record period. The students were not asked if they were trying to lose weight, but it seems evident that many were. A second factor is the health supervision given to these private school pupils by both school and private physicians. It is reasonable to assume that those who were markedly overweight or underweight were advised on diet. In addition to these two factors which operate through a deliberate or conscious attention to food intake, changing energy need during adolescence has considerable effect on the appetite and consumption level. For example, a thin, rapidly growing boy may eat very heartily. Growth is likely to occur in spurts and weight gain frequently is not maintained although the appetite for large amounts of food is stimulated. Over a period of time, weight catches up and the habit of eating heartily may continue long enough to cause overweight, but in time, the reduced physiological need effectively limits intake through reduced appetite. Thus, there is a significant time lag between consumption level and weight, which is very important during adolescence. In a cross-sectional survey which compares weight at a given time with diet at a given time, the above factors operate to produce the inverse relationship observed.

The limitations of a cross-sectional survey are sometimes overlooked, and the identification of persons with a deficient intake and close correlation between diet and individual status are expected.

Since weight at a given time reflects the cumulative effect of previous consumption level, it is not necessarily correlated with the current dietary intake. Data on change in weight are needed to determine whether caloric intake is in balance with energy expenditure. High positive correlation between weight change and caloric intake can be expected only if observations are made over a sufficient period of time and if caloric intake can be expressed in terms of its relation to a carefully determined individual requirement. Individual requirements differ so widely that consumption below an average need may be entirely adequate and an over-average intake may be insufficient.

It is pertinent to mention what information of value is obtained from a cross-sectional survey, if it does not permit the selection of undernourished persons. In brief, averages and distributions describe the group situation grossly and give an indication of the probable prevalence and degree of insufficiency in the diets, provided that the requirement level for the specific group can be determined with fair accuracy. The more prevalent and the more severe the deficiency is among any group, the more clearly will it be shown. Comparison of groups will reveal real differences in consumption levels and in the extent and frequency of deviations from an estimated need. Knowledge of group dietary deficiencies can be useful for guidance in shaping public or community policies and programs affecting nutrition. It affords sound evidence for selecting groups which are in need of more intensive or more individual investigation and attention.

For this group of privileged children, the data on consumption level for calories furnish a good general description of their status with respect to calories. On the average, the calorie values for boys and girls were very close to their estimated energy requirements, and judged by their weights, the majority of these pupils had been consuming adequate calories. Furthermore, the prevalence of obese and of underweight children is consistent with the dietary evidence

that a considerable number of children had higher calorie diets and lower calorie diets than their requirements. Although many of the very low-calorie diets were for obese children, these suggest an inadequate *current* intake, and reducing diets may present a nutritional problem as important as inadequate diets which have previously produced underweight.

Caloric Intake of Low-Income Group

Data on caloric intake of the public school pupils are presented for three separate groups: Jewish, Italian, and all other white pupils. For convenience, these are referred to as cultural groups. For each sex, the findings are given for two age groups, 13-15 years and 16-19 years. From the age distribution of the public school pupils, shown in Table 11, it is apparent that this group is more heavily weighted with older boys and girls than is the private school group. The number of 13-year-old pupils in the public school is so small that the 13-15 year-old group will be compared with the 14-15 year-old group in the private school.

Calories Daily. The mean daily caloric intake for specific sex-age and cultural groups and various measures of the distributions are shown in Table 12.

Table 11. Age distribution of boys and girls with three or four-day diet records in a public school in New York City.

Age	Boys			Girls		
	Jewish	Italian	Other	Jewish	Italian	Other
All Ages	100.0	100.0	100.0	100.0	100.0	100.0
13	2.8	1.5		2.5	1.0	5.1
14	11.8	14.9	11.3	13.2	14.9	7.7
15	26.1	15.9	19.9	31.3	36.6	24.4
16	29.8	30.8	24.8	32.3	24.8	34.6
17	21.9	25.4	28.4	15.7	17.8	24.4
18	6.6	10.4	14.9	4.6	4.0	3.8
19	0.9	1.0	0.7	0.4	1.0	
Number of Pupils	739	201	141	713	101	78

Among the boys, the mean daily caloric intake is somewhat higher for the older than for the younger age group in each cultural group, but the difference by age is not significant statistically for any of the cultural groups. For girls, the difference by age was not consistent, but for two cultural groups the mean intake is slightly higher for ages 13-15 years than for ages 16-19 years. Only for the Jewish girls is the higher caloric intake at ages 13-15 years significant; the probability of the difference of 88 calories being due to sampling is .01-.02.

When specific sex-age groups for the three cultural groups are

Table 12. Mean calories daily, median, range, and measures of dispersion for distributions of individual caloric intake for boys and girls in a public school in New York City for whom three or four-day diet records were obtained.

Cultural Groups Sex and Age	Number	Mean Calories and Standard Error	S. D.	C. V.	Median	Range
Boys:						
Jewish	739	2,660± 22	596	22	2,603	
13–15 Years	301	2,614± 32	568	22	2,559	1,242–5,296
16–19 Years	438	2,691± 29	613	23	2,638	983–4,836
Italian	201	2,878± 47	672	23	2,830	
13–15 Years	65	2,757± 75	604	22	2,767	1,298–4,675
16–19 Years	136	2,936± 60	696	24	2,848	1,612–5,505
Other	141	3,034± 63	743	24	3,075	
13–15 Years	44	2,918± 82	542	19	2,967	1,901–4,386
16–19 Years	97	3,087± 83	815	26	3,150	1,580–5,472
Girls:						
Jewish	713	2,062± 18	483	23	2,025	
13–15 Years	335	2,108± 28	518	25	2,071	722–3,795
16–19 Years	378	2,020± 23	447	22	1,983	900–3,576
Italian	101	2,281± 47	468	21	2,286	
13–15 Years	53	2,249± 61	446	20	2,285	1,147–3,236
16–19 Years	48	2,317± 71	493	21	2,289	1,401–3,685
Other	78	2,319± 69	611	26	2,233	
13–15 Years	29	2,431±107	576	24	2,450	1,649–3,753
16–19 Years	49	2,253± 90	628	28	2,150	1,345–3,921

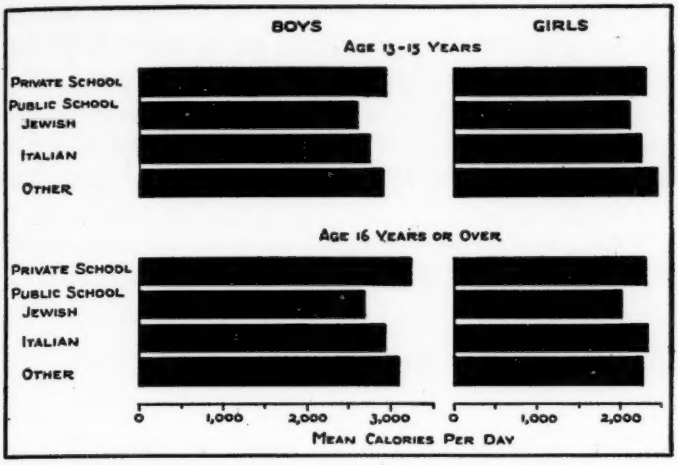

Fig. 3. Mean caloric intakes per day reported for boys and girls in a public school compared with means for private school pupils in New York City. Public school pupils aged 13-15 years compared with private school pupils aged 14-15 years.

compared, it is found that the mean caloric intake is lowest for the Jewish group and highest for the "other" or miscellaneous group. As shown in Figure 3, this order is consistent with the exception that Italian girls aged 16-19 years had a slightly higher intake than girls classified as "other." However, the differences between the mean daily calories for Italians and "others" are not significant statistically for any sex-age group. Also, at ages 13-15 years, the differences between mean calories for Jewish and Italian boys, and for Jewish and Italian girls are not significant. But at ages 16-19 years, Jewish boys and girls had a significantly lower caloric intake than the Italian boys and girls; and the caloric intake for each Jewish sex-age group is significantly lower than that for the corresponding sex-age group of the "other" cultural group. For each significant difference between mean calories which is mentioned, the probability is $<.01$; nonsignificant differences had a probability $>.05$.

In Figure 3, the mean caloric intake of specific sex-age groups

in the private school is compared with means for the public school groups. Girls aged 16-18 years in the private school had a significantly higher caloric intake on the average than Jewish girls aged 16-19 years in the public school ($P < .01$),* but the mean intake for private school girls did not differ significantly from any other public school group. For boys in the private school, the mean caloric intake

Table 13. Caloric intake as percentage of estimated individual requirement for boys and girls in a public school in New York City for whom three or four-day diet records were obtained.

Cultural Groups Sex and Age	Number[1]	Calorie-Per Cent Mean and Standard Error	Standard Deviation	Coefficient of Variation	Median
Boys:					
Jewish	692	81.6±0.82	21.7	27	81.3
13–15 Years	290	82.5±1.29	22.0	27	82.7
16–19 Years	402	80.9±1.07	21.5	27	80.5
Italian	197	91.0±1.76	24.7	27	88.4
13–15 Years	65	89.3±3.26	26.3	29	86.6
16–19 Years	132	91.9±2.09	24.0	26	90.1
Other	136	92.5±2.02	23.5	25	93.7
13–15 Years	42	92.6±3.03	19.6	21	93.4
16–19 Years	94	92.5±2.59	25.1	27	93.8
Girls:					
Jewish	694	86.0±0.90	23.8	28	85.0
13–15 Years	326	85.6±1.37	24.7	29	83.9
16–19 Years	368	86.3±1.20	23.1	27	85.9
Italian	91	97.8±2.93	27.9	29	94.6
13–15 Years	51	95.0±3.64	26.0	27	89.6
16–19 Years	40	101.2±4.77	30.2	30	97.0
Other	75	97.0±3.48	30.1	31	93.2
13–15 Years	28	99.1±4.37	23.1	23	106.0
16–19 Years	47	95.7±4.93	33.8	35	87.5

[1] Pupils for whom height and weight were not available are omitted.

*If unusual and reducing diets had not been excluded from the private school group, the intake for these older girls would not be significantly higher than the intake for Jewish girls in the public school (*see* Table 3). In the public school, the number of diets reported as unusual was so small that the means would not be affected if they were excluded.

for each age group is higher than the mean for the corresponding age group of Jewish boys in the public school ($P < .01$); and at ages 16-18 years the mean intake for the private school group is also significantly higher than that for Italian boys (P .01-.02).

Intake in Relation to Requirement. The caloric intake as a percentage of the estimated individual requirement is shown for each of the various public school groups in Tables 13 and 14, and in Figure 4. The mean calorie-per cents do not differ significantly by age for either sex in any cultural group. Comparisons between sexes and cultural groups and with the private school pupils, therefore, are made for combined age groups.

Girls had, on the average, more adequate consumption of calories than boys. For each cultural group in the public school, the mean calorie-per cent for boys is significantly less than 100 per cent of need, and Jewish boys had, on the average, only 82 per cent of their estimated energy requirement. Among girls, only for the Jewish group is the mean calorie-per cent significantly less than the estimated need.

When mean calorie-per cents for the cultural groups are com-

Table 14. Percentage distributions of three or four-day diets according to the percentage of estimated individual calorie requirement for boys and girls in a public school in New York City.

Percentage of Requirement	Boys			Girls		
	Jewish	Italian	Other	Jewish	Italian	Other
Total	100.0	100.0	100.0	100.0	100.0	100.0
49.9 or Less	5.6	1.5	2.9	4.3	1.1	2.7
50.0– 69.9	25.3	16.8	19.1	22.3	14.3	20.0
70.0– 89.9	37.1	34.5	22.1	33.0	29.7	24.0
90.0–109.9	23.3	27.9	34.6	24.8	25.3	21.3
110.0–129.9	6.4	11.2	15.4	11.7	15.4	20.0
130.0–149.9	1.7	5.6	4.4	3.3	9.9	6.7
150.0–169.9	0.3	2.0	0.7	0.3	3.3	1.3
170.0 or More	0.3	0.5	0.7	0.3	1.1	4.0
Number of Pupils	692	197	136	694	91	75

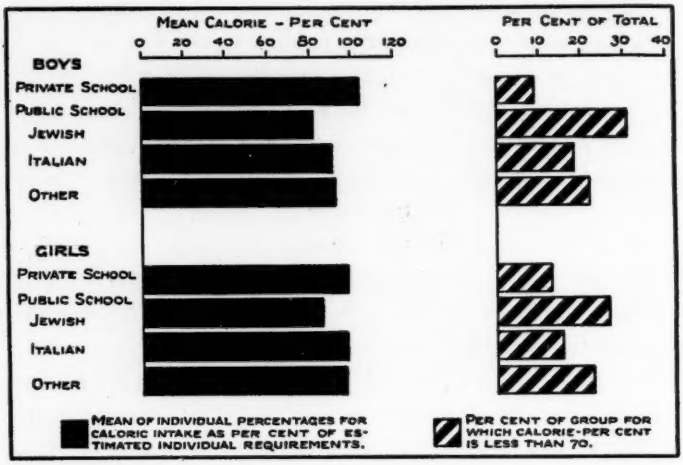

Fig. 4. Caloric intake in relation to estimated individual calorie need for private school pupils aged 14-18 years and public school pupils aged 13-19 years.

pared, both the Jewish boys and Jewish girls are found to have a significantly lower mean calorie-per cent than those of the same sex in either of the other groups ($P < .01$). But mean calorie-per cents for Italians and "others" differ very little and not significantly.

In the private school group, for boys aged 14-18 years the mean calorie-per cent is significantly higher than the mean for boys aged 13-19 in each cultural group in the public school. For each difference between means in the three comparisons P is $< .01$. Differences between the mean calorie-per cents for the private school group and for the public school groups are relatively greater than the differences in the number of calories. This is because the calorie requirements, as shown in Table 2, were higher for the public school boys. Among the public school girls, only for the Jewish group is the mean calorie-per cent significantly lower ($P < .01$) than that for the private school girls.

From the distributions of calorie-per cents for individual diets shown in Table 14, it will be noted that from 67 to 74 per cent of

the boys in the different cultural groups had diets for which the calorie-per cent was from 70 to 129, and from 65 to 70 per cent of the girls had diets within this range, compared with 73 per cent of boys and of girls in the private school. But calorie-per cents 130 or higher are found for only 2 per cent of the Jewish boys, 8 per cent of the Italian, and 6 per cent of the "other" boys in the public school as against 18 per cent of the private school boys. Among girls, calorie-per cents 130 or higher are found almost as frequently for the Italian and "other" groups as for the private school girls, but only 4 per cent of the Jewish girls had a caloric intake 30 per cent or more above requirement as compared with 15 per cent of the private school girls. The frequency of diets which furnished less than 70 per cent of energy need is shown in Figure 4 for both the public and private school pupils. Of the private school boys, 9 per cent had diets for which the calorie-per cent is less than 70 as against 31 per cent of the Jewish boys in the public school, 18 per cent of the Italian boys and 22 per cent of "other" boys. Among girls, diets furnishing less than 70 per cent of calorie need were twice as prevalent for the Jewish group in the public school as for the private school group, 27 per cent as against 13 per cent. Although the calorie-per cent was less than 70 for 15 and 23 per cent of the Italian and "other" girls, respectively, the frequency of such diets is not significantly higher than among the private school girls.

In summary, these data indicate that the Jewish boys and girls in the public school were less well nourished with calories than the other public school pupils in the Study and less well nourished than the pupils in the private school. Boys, but not girls, in the non-Jewish groups in the public school also were less well supplied with calories than the private school pupils.

Summary

Diet histories and records of daily activity for about 300 pupils in a private high school and 2,000 pupils in a public high school in

New York City are analyzed with reference to caloric intake and energy requirement of boys and girls of different ages.

The average calorie requirement for girls determined from individual estimates based on basal energy according to age and surface area and allowances for hours of sleep and of activity at four levels changed very little from ages 12 to 18 years and was close to 2,400 calories daily. The average requirement for boys increased significantly with age from 12 to 16 years and remained about at a level from 16 to 18 years; the minimum average of 2,576 calories daily was for boys aged 12 years in the private school and the maximum of 3,407 calories was for boys 17 years old in the public school. The magnitude of the differences in individual requirements shows clearly that average requirements are unsuitable for an evaluation of the adequacy of individual caloric intake.

The limitations of data from this Study and most surveys for the evaluation of individual intake, even on the basis of individual need and caloric intake, are discussed. Individual variation in basal metabolism, errors in estimates of energy expended, errors in the dietary record, and day-to-day variation in caloric intake make it impossible to identify with certainty the individuals whose consumption levels are adequate or inadequate.

The caloric intake of pupils in the private high school was, on the average, approximately equal to their estimated calorie need. However, for 9 per cent of the boys and 14 per cent of the girls, the calories consumed were less than 70 per cent of the estimates of their requirements, and for 18 per cent of the boys and 13 per cent of the girls consumption was 30 per cent or more above requirements.

Obesity was rather prevalent among the private school pupils. Physicians had rated 12 per cent of the boys and 14 per cent of the girls as either moderately or markedly obese; and 26 per cent of the boys and 23 per cent of the girls were 15 per cent or more overweight by Baldwin-Wood standard weight for age and height. Only 1 per cent of the boys and 2 per cent of the girls were 15 per

cent or more underweight, but 6 and 11 per cent, respectively, were from 7.5 to 15 per cent underweight.

Weight status of the private school pupils and individual caloric intake expressed as a percentage of estimated need (calorie-per cent) showed an inverse relationship. Diets furnishing less than 70 per cent of need were more prevalent among overweight pupils than among underweight pupils, and high-calorie diets were more prevalent among underweight pupils. Causes of this inverse relationship are discussed.

Caloric intake for pupils in the public school, all of whom were from low-income families including some on relief, is given separately for Jewish, Italian and "other" pupils. The mean caloric intake for boys and for girls in the Jewish group was lower than that for corresponding sex-age groups of Italian and "other" pupils, but there was little difference between the calorie level for Italian and "other" pupils. As percentage of individual requirement, for Jewish boys the mean calorie-per cent was 82 and for girls it was 86; for Italians, the mean calorie-per cents were 91 and 98; and for "others" the means were 93 and 97 for boys and girls, respectively.

Boys in each group in the public school had a significantly lower mean calorie-per cent than the private school boys, but only the Jewish girls had a lower mean calorie-per cent than the private school girls.

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A STUDY OF MOBILITY AMONG TUBERCULOUS HOUSEHOLDS IN UPPER HARLEM[1]

SALLY PREAS AND JEAN DOWNES

THE mortality from tuberculosis among Negroes in New York City presents a serious problem. A tuberculosis mortality rate for Negroes which in 1940[2] was more than five times the rate for white persons offers a definite challenge to those interested in the study and control of the disease. One important factor in the control of tuberculosis among Negroes is the stabilization of the family. It is apparent that the movement of persons in and out of tuberculous households may increase the risk of the spread of tuberculosis and may make difficult or impossible adequate follow-up work of cases and contacts. The objective of this paper is to describe the flow of population through a group of Negro tuberculous households because of its definite relationship to the problem of control of the disease among them and its probable relationship to the spread of tuberculosis in the Negro community.

DATA AND METHOD OF STUDY

The source of the material for this report was the special study for the control of tuberculosis among Negroes started April 1, 1939, by the Community Service Society, the Bureau of Tuberculosis of the Department of Health, and the Milbank Memorial Fund. The special study was set up in an area (Health Area 8) of Upper Harlem comprised of some thirty-five city blocks. Thirty-one thousand Negroes in 8,700 household units live in this area.[3] The

[1] From the Milbank Memorial Fund, the Community Service Society, and the New York City Department of Health.

[2] The rate for white persons was 43 per 100,000; for Negroes and other colored 220 per 100,000. *From:* "Net Tuberculosis Mortality, 1940." New York Tuberculosis and Health Association.

[3] *From:* Census Tract Data on Population and Housing, New York City, 1940. Bureau of the Census, U. S. Department of Commerce.

families of all active or recently active cases of tuberculosis in the area are being given intensive public health nursing and clinic supervision.

Detailed records concerning the social and economic condition of each family are being obtained. The families are visited by the public health nurse at least once a month for the first year in order to note any changes in these conditions. The data being collected have been described in more detail in a previous paper.[4] The information which was essential for the present report was the record of all changes occurring in the composition of the household together with data describing certain social, economic, and biological characteristics of the population.

The households included in this study of mobility constitute a cross-section of the total households in Health Area 8 which had nursing supervision. Only households which were under supervision at some time during the period, April 1, 1941 to March 31, 1942, were selected. The minimum period of observation was two months, and the maximum, three years—from April 1, 1939 to March 31, 1942. Households in which the tuberculous case responsible for bringing the members under supervision was a lodger were excluded. Only households in which the index case was a family member or a person related to some member of the family were considered. Also excluded was any household which came under supervision because of a move to that household of a person already present in the study. If a person under supervision moved into a home already under supervision, both households were studied, but no households were included which came under supervision as a result of a move of a person. If part of a family moved and set up its own establishment, the new unit was still included in this study; the persons who moved were considered as contributing to the experience of two different household units,

[4] Downes, Jean and Price, Clara R., R.N.: The Importance of Family Problems in the Control of Tuberculosis. The Milbank Memorial Fund *Quarterly*, January, 1942, xx, No. 1, pp. 7-22.

but their individual identities were retained for the purpose of relating all moves of the same person.

Description of Households

In this paper the term "household" has been used to designate all persons dwelling in a home regardless of blood relationship. The term "family" has been reserved for the simple biological unit consisting of husband and wife with or without children, husband only and children, or wife only and children.

It has already been stated that each household was selected because of a case of active or recently active tuberculosis in a family member or related person. When the person with tuberculosis is the husband or wife, the stability of the family unit may be greatly affected by that person's disability, hospitalization, or death. In 44 per cent of the 266 study households the index case was either the husband or wife in the family. In the remaining households the index case was a son or daughter or other relative.

Since economic factors undoubtedly are of importance in in-

Table 1. Households classified according to sex and age of head of house—Upper Harlem area of New York.

Age of Head of Household	Head of Household Male	Head of Household Female	Head of Household Male	Head of Household Female
	Per Cent		Number	
Total Households	100.0	100.0	170	96
20–24	3.0	3.2	5	3
25–29	6.6	8.4	11	8
30–34	16.9	10.5	28	10
35–39	18.7	21.0	31	20
40–44	19.9	17.9	33	17
45–49	15.1	15.8	25	15
50–54	10.8	11.6	18	11
55–59	4.8	4.2	8	4
60+	4.2	7.4	7	7
Unknown Age			4	1

fluencing family stability, it is necessary to give some description of the economic status of the group. An average annual income per adult cost unit was figured for each household unit.[5] This average applied only to family members and to other relatives when they shared the family expenses. The rent paid by lodgers was added to the family income, but lodgers were not included in the adult cost units. The average was based on the entire period of observation rather than on a single visit. The median income for the 266 households was $383 per adult cost unit per year. The lower quartile was $277 and the upper, $545. The median monthly rent paid was $33. The quartile range for rent was $10, that is, from $30 to $40. The monthly rent described here was not an average for the period studied, but the actual amount reported on the first visit.

The constitution of the household is of special interest in relation to the mobility of the unit itself or of its members. In 36 per cent of

Table 2. Households classified according to presence of husband and wife in the home[1]—Upper Harlem area of New York.

Status of Husband and Wife[2]	Per Cent	Number of Households
Total Households	100.0	266
Both Husband and Wife Present	61.8	160
Husband Present, Wife Dead	2.7	7
Separated	0.8	2
In Institution[3]	0.4	1
Wife Present, Husband Dead	15.4	40
Separated	16.9	44
Deserted	0.4	1
Divorced	0.8	2
In Institution[3]	0.4	1
In Army	0.4	1
Head of House Single Individual		7

[1] A husband or wife in a hospital because of tuberculosis is counted as present in the household.
[2] Status of husband and wife as of the first visit to the household.
[3] Other than for tuberculosis.

[5] Income is expressed per adult cost unit (food cost unit) because this method allows for the relative cost of maintenance of children and adults.

the total households the head of the house at the time of the first visit to the home was female. Table 1 shows the age distribution of the heads of households according to sex. It is evident that the age distribution for female heads was similar to that for males. Approximately two-thirds of the females and slightly more than two-thirds of the males were between the ages of 30 and 49. There were relatively few heads of households in the older age groups (50 years and over).

In only 62 per cent of the households studied were both husband and wife a part of the family unit. This percentage included households in which a husband or wife was in a hospital or sanatorium for tuberculosis. Any person related to the family was counted as present in the home throughout his hospitalization for tuberculosis. Table 2 gives the explanation of the absence of either husband or wife. Death and separation appeared to be responsible for the majority of broken homes.

The absence of older persons was not limited to the heads of households. The age content of the household at the time of the nurse's first visit is shown in Table 3. Only 8 per cent of all households contained persons 60 years of age or older. Approximately

Table 3. Distribution of households according to age of members[1]—Upper Harlem area of New York.

Age Content of Household	Per Cent	Number of Households
Total Households	100.0	266
Adults Only	48.5	129
Adults 15–59 Years of Age Only	44.4	118
Adults 15–59 and 60 or More Years of Age	4.1	11
Adults and Children	51.5	137
Infants Only	3.0	8
Infants and Children 1–14	4.5	12
Children 1–14 Only	44.0	117
Total Households Containing Persons 60 Years of Age or Older	8.0	23

[1] Age of members as of the first visit to the household.

one-half the households consisted of adults, mainly between the ages of 15 and 59. Infants were present in about 8 per cent and children aged 1 to 14 were present in 49 per cent of the homes. In terms of the total persons observed at any time throughout the study period 3 per cent were less than one year of age, approximately 3 per cent were aged 60 or over, and 21 per cent were in the 1-14 age group. The largest proportion of the population consisted of middle-aged adults.

Another way of describing the constitution of the household is in terms of the family units included within the household unit. These data are shown in Table 4. At the time of the first visit to the home 19 per cent of the households contained more than one family unit as defined earlier in this paper. In 14 per cent of the total households there were related family units living together, but in the other 5 per cent there were one or more unrelated or lodger family units living in the home. The nonmultiple family households were mainly one-family households. Seven households, or 3 per cent of the total number, consisted of one individual living alone, and 6 per cent were classed as partner households. The partner households were composed of two or more persons who shared the same apartment, who may or may not have been related, but who did not constitute a family unit.

Table 4. Distribution of households according to type of family unit[1]—Upper Harlem area of New York.

Type of Household Unit	Per Cent	Number of Households
Total Households	100.0	266
Multiple Family Households—Composed of:	18.8	50
Related Units	14.3	38
Unrelated Units	4.5	12
Nonmultiple Family Households—Composed of:	81.2	216
One-Person Household	2.6	7
Partner Household	5.7	15
One-Family Household	72.9	194

[1] Type of family unit as of first visit to the household.

The average size of household on the first visit was 4.2 persons. Figure 1 shows the percentage distribution of households according to size on the first and last visits of the study period. The average size of household at the last observation was 3.7 persons. Figure 1 indicates a decrease in the proportion of households of three, four, six, or more than six persons, and an increase in those of one, two, and five persons during the study period. These data reveal the presence of a changing population, but express only the balance of the changes. In order to discover the actual amount of mobility it is necessary to consider the incidence of moving during the study period.

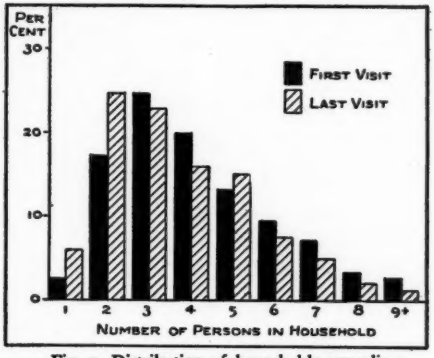

Fig. 1. Distribution of households according to size on the first and last visits of the study period.

Incidence of Moving

Preliminary to any statement of rates of moving it is essential to define what constituted a move. In this study there were two types of moves under consideration, one the movement of an entire household unit and the other the movement of persons in and out of a household unit.

All moves of the entire household unit to another address, either within the study area, out of the study area, or back into the area subsequent to an earlier move out were counted as household moves, provided the unit was observed for at least two months. Any household unit moving out of the study area prior to the completion of two months' supervision was excluded from this study. Moves within the same apartment house were not counted as household moves.

Individual moves included all moves of persons in or out of the households included in the study, regardless of the length of time the persons were under observation; the only exceptions were persons hospitalized for tuberculosis and visitors. A family member or relative in a tuberculosis hospital or sanatorium was regarded as present in the home. His admission to a hospital because of tuberculosis was not counted as a move unless it was definitely established that he would return to a different household upon discharge. A person who upon discharge did not return to the household where he was considered as present was treated as moving on the date of discharge from the hospital. Persons who entered or left the home on a visit were not considered as moving unless the visit was of unusually long duration.[6]

Table 5. Distribution of households according to number of moves of households—Upper Harlem area of New York.

Number of Household Moves	Per Cent	Number of Households
Total Households	100.0	266
0	65.4	174
1	27.8	74
2	4.5	12
3	1.1	3
4	0.4	1
5	0	0
6	0.8	2

The average annual moving rate for household units was 29.9 per 100 observed. Table 5 presents the distribution of households according to the number of moves made by each. Sixty-five per cent of the total households remained in the same dwelling throughout the study period. Twenty-eight per cent moved once, and 5 per cent moved twice. Only 2 per cent moved three or more times. Apparently the moving rate for this sample of households was not influenced to any great extent by multiple moves of the same household.

The movement of persons through tuberculous households is

[6] Examples of visitors who were counted as moving were one individual who entered a household on a visit and remained six months, another who remained nine months and was still "visiting" at the time of the last observation, and another who left for the Virgin Islands on a visit.

Classification of Moves	Rate per 100 Persons per Year	Number of Moves	Number of Person-Years
Total Moves In	13.2	212	1,610
Total Moves Out	17.7	285	1,610
Moves In (Excluding Lodgers)	6.3	94	1,490
Moves Out (Excluding Lodgers)	11.3	168	1,490
Lodger Moves (In and Out)	195.8	235	120
Other Relatives (Moves In and Out)	46.6	122	262

Table 6. Rate of individual moves in and out of tuberculous households—Upper Harlem area of New York.

shown in Table 6. The total rate of moving in was thirteen moves per 100 persons per year. The rate of moving out was eighteen per 100 persons per year. The excess of "moves out" over "moves in" was increased when moves of lodgers were excluded — the rates were lowered to six and eleven, respectively. The total rate of moving in and moving out for lodgers was 196 per 100 persons per year. In other words, lodgers moved on the average twice a year. Persons who were related to the family but who were not members of the immediate family unit had a moving rate of forty-seven per 100 persons per year. Evidently family members were, on the average, the least mobile persons, other relatives were next, and lodgers were by far the most mobile.

Table 7. Average number of months of observation of households classified by type of unit[1]—Upper Harlem area of New York.

Type of Household Unit	Mean Number of Months of Observation per Household	Standard Deviation	Standard Error of Mean	Number of Households
Simple Unit	18.3	10.94	±1.00	119
Simple Unit and Relatives	19.5	10.10	±1.06	90
Simple Unit and Lodgers	18.0	11.70	±2.14	30
Simple Unit and Other Relatives and Lodgers	16.2	7.44	±1.66	20

[1] Type of unit as of the first visit to the household.

In an effort to determine what kind of households presented the greatest risk of having persons move in and out, the households were grouped into four classes according to the composition of the household. The biological family unit, as defined previously, formed the basis of the classification. One-person households were excluded. Households were grouped according to whether at the time of the first visit they contained (1) the simple family unit only, (2) the simple family unit and "other relatives," (3) the simple unit and lodgers, and (4) the simple unit with both "other relatives" and lodgers. The four groups were considered to be fairly comparable with respect to the period of time the households were under supervision. The average number of months of observation per household for the four groups ranged only from sixteen to nineteen months. These data are shown in Table 7.

The rates of individual moves through the four groups of households are presented in Table 8. The moves include both entries and departures. The moving rates for the four groups showed a striking difference, varying from 19.4 per 100 persons per year for the simple biological unit to 78.2 for the most complex unit containing both "other relatives" and lodgers. Since the moving rate for lodgers was found to be far higher than that for family members and "other relatives," it is of interest to note what proportion of the

Table 8. Rate of individual moves in and out of tuberculous households classified according to type of unit[1]—Upper Harlem area of New York.

Type of Household Unit	Rate per 100 Persons Per Year	Total Moves of Persons	Number of Person-Years
Simple Unit	19.4	126	649
Simple Unit and Relatives	30.0	192	640
Simple Unit and Lodgers	41.6	77	185
Simple Unit and Other Relatives and Lodgers	78.2	97	124

[1] Type of unit as of first visit to the household.

moves were lodger moves. Table 9 indicates that for the units which contained no lodgers on the first visit, more than two-thirds of the moves were those of persons related to the family. For households containing lodgers but no "other relatives," 84 per cent of the total moves were lodger moves, and for households containing "other relatives" and lodgers, 72 per cent of the moves were made by lodgers. It is apparent that the most stable households were those containing no persons outside the simple biological family. The mobility of the members of the household was increased by the presence of "other relatives" and even more by the presence of lodgers in the home. The greatest mobility occurred when the home contained both "other relatives" and lodgers.

The question may arise as to how much the moving rates were affected by multiple moves of the same person. Table 10 shows that few persons in any group moved three or more times. The proportion of persons who moved once or twice during the period of observation was directly related to the complexity of the household unit. For example, in the simple family unit households, only 5 per cent

Table 9. Individual moves classified according to type of household unit[1]—Upper Harlem area of New York.

Type of Household Unit	Total	Moves of Relatives	Moves of Lodgers
	PER CENT		
Simple Unit	100.0	70.6	29.4
Simple Unit and Other Relatives	100.0	69.8	30.2
Simple Unit and Lodgers	100.0	15.6	84.4
Simple Unit and Other Relatives and Lodgers	100.0	27.8	72.2
	NUMBER OF INDIVIDUAL MOVES		
Simple Unit	126	89	37
Simple Unit and Other Relatives	192	134	58
Simple Unit and Lodgers	77	12	65
Simple Unit and Other Relatives and Lodgers	97	27	70

[1] Type of unit as of first visit to the household.

of persons moved twice, as compared with 15 per cent in the most complex group, households with "other relatives" and lodgers. Persons moving twice did have some weight in the group of households containing "other relatives" and lodgers. However, the moving rates seem to be influenced mainly by whether a person moved or did not move rather than by the number of times he moved. In terms of households, 62 per cent of those which had no moves in or out were simple units, 31 per cent contained "other relatives," 30 per cent lodgers, and 5 per cent "other relatives" and lodgers.

Even though the populations of some of the groups of households were relatively small in number, it is of interest to examine the moving rates by age. These data are presented in Table 11. In the two groups of households which contained no lodgers on the first visit, the moving rates for persons aged 15-29 were considerably in excess of the rates for all ages. It is important to note that all in-

Table 10. Distribution of persons according to number of moves and type of household unit—Upper Harlem area of New York.

Classification of Person Moves	Simple Unit	Simple Unit and Other Relatives	Simple Unit and Lodgers	Simple Unit and Other Relatives and Lodgers
	per cent			
Total Persons	100.0	100.0	100.0	100.0
No Move	82.7	72.1	63.8	49.3
One Move	10.2	19.0	28.2	34.5
Two Moves	5.3	7.3	8.0	14.8
Three or More Moves	1.8	1.6		1.4
	number			
Total Persons	450	491	174	142
No Move	372	354	111	70
One Move	46	93	49	49
Two Moves	24	36	14	21
Three or More Moves	8	8		2

dividual moves do not indicate family instability. It is to be expected that some persons will leave a household to establish one of their own and that others may move into a household as the result of marriage with a person in that home. It would be of value to determine how much of the moving described here might be considered excessive and how much "normal." However, it was not possible to obtain data on a control group for comparison or to obtain information on this group as to reasons for moving. Undoubtedly some proportion of the moving of persons, especially in the age group 15-29, is to be expected and cannot be interpreted as

Table 11. Rates of moving for persons in tuberculous households according to age and type of household unit—Upper Harlem area of New York.

Age Groups	Simple Unit	Simple Unit and Other Relatives	Simple Unit and Lodgers	Simple Unit and Other Relatives and Lodgers
	RATE PER 100 PERSONS PER YEAR			
All Ages	19.4	30.0	41.6	78.2
Under 15	12.1	16.5	19.4	63.6
15–29	35.1	50.6	37.7	124.2
30+	11.9	26.6	53.4	60.9
	NUMBER OF MOVES			
All Ages	126	192	77	97
Under 15	21	32	7	14
15–29	73	87	23	41
30+	32	73	47	42
	NUMBER OF PERSON-YEARS			
All Ages	649	640	185	124
Under 15	173	194	36	22
15–29	208	172	61	33
30+	268	274	88	69

evidence of family instability. For the group of households containing lodgers only, the highest rate occurred at ages 30 and over. It should be remembered that 84 per cent of the moves for all ages in this group were lodger moves. In households containing "other relatives" and lodgers, persons aged 15-29 moved on the average of slightly more than once a year. The populations were not large, but with the exception of the group composed of the simple unit and lodgers, the rate was consistently highest for persons aged 15-29.

The question may be raised as to whether the differences in the moving rates for the four groups of households were due to some factor which was associated with type of household. One such factor which may have been important was size of household. The average size of household at the time of the first visit was 3.6 for the simple unit, 4.7 if "other relatives" were present, 4.6 when lodgers were included, and 5.4 when the household contained both "other relatives" and lodgers. It is apparent that size of household was related to type of household, as it was described here. However, the fact of the somewhat higher moving rate for "other relatives" as compared with family members, and the strikingly higher rate for lodgers, seems to indicate that the relationship of the persons in the household may have been more important than simply the number present.

Economic factors might also be related to the type of household and the amount of moving. The median monthly rent at the time of the first visit was $30 for simple units, $35 for units with "other relatives," $40 for units with lodgers, and $40 for units with "other relatives" and lodgers. Evidently there was some relationship between rent and type and size of household. Obviously the presence of more persons may require a higher rent or the higher rent may necessitate the presence of more persons to help meet the cost.

Average annual income appeared to have less relationship to the moving rates for each type of household. The two groups of households which contained lodgers had a higher median income

per adult cost unit than those without lodgers. The simple unit had a higher median income than that for the unit including "other relatives." The median annual incomes per adult cost unit were $368 for the simple unit, $334 for the unit with "other relatives," $438 for that with lodgers, and $512 for that containing "other relatives" and lodgers. Apparently the status as to relief of the household was not associated with the amount of moving of persons. Relief was received by 70 per cent of the simple units, 61 per cent of the units with "other relatives," 67 per cent of those with lodgers, and 63 per cent of those with "other relatives" and lodgers.

Another factor which may be related to stability is the marital status of the head of the household. The percentage of heads of households who were either widowed, separated, or divorced was 29 for the simple unit, 40 for the unit containing "other relatives," 37 for that containing lodgers, and 40 for that containing both "other relatives" and lodgers. The smaller percentage of broken homes in the simple-unit households may have been a factor making for stability, but for the other three groups the difference in the percentage of broken homes does not vary directly with the amount of moving.

Discussion

All the evidence seems to indicate that the type of household which experienced the least mobility was that composed of the simple biological family. This household was a relatively smaller one and paid on the average a lower rent than that which contained other persons. Households containing persons other than family members experienced a greater amount of moving through the household when the persons were lodgers than when they were related to the family, and the greatest amount when both "other relatives" and lodgers were present.

When it is considered that the households in question were selected because of an active or recently active case of tuberculosis,

85 per cent of which were known to be infectious, the movement of persons in and out of the home is of great significance. The importance of household contact in the spread of tuberculosis is well established. New cases of reinfection tuberculosis occurred among contacts in these families at the rate of 2.2 per 100 persons per year. Therefore, it seems probable that on the whole persons moving into a group of households selected as these, were exposed to an increased risk of tuberculosis, and that persons moving out offered an increased risk to the households into which they moved. It would be of interest to attempt to measure the risk to the community due to persons moving into and out of the tuberculous family, but the persons who are the most mobile are often extremely difficult to follow and supervise. To trace the lodger or person related to the family from one address to another and to persuade him to have a chest examination is not an easy task. The relatively long period between exposure to tuberculosis and the development of clinical symptoms adds to the difficulty of determining how much infection is spread by moving persons. However, in view of the high prevalence of tuberculosis among Negroes, the possibility that persons moving in and out of tuberculous households may contribute greatly to the spread of the disease should be taken note of even though the risk cannot be measured precisely.

The flow of population through Negro tuberculous households has other broad implications in relation to the problem of the control of the disease. The households which call for particular attention are those with "other relatives" and lodgers living in the home. The presence of persons outside the immediate family in the home often results from economic difficulties. The keeping of lodgers is a common way of supplementing income in Harlem. The need for special financial aid for tuberculous families has been emphasized before as a means of raising their level of living. The need becomes even more urgent in order to prevent additional risk to other members of the community. A "floating" population such

as the group observed here may be difficult to supervise, but emphasis can be placed on the tuberculous household, and efforts can be directed toward preventing persons from moving into the tuberculous household. Nursing supervision can be directed toward stabilizing the family unit, toward preventing the break-up of the home, especially when its existence is threatened by the death or illness of a member. Much remains to be done among Negro families, but if the tuberculous environment can be limited and properly supervised, we can hope for more positive results in the control of the disease among them.

SOCIAL MEDICINE: ITS MEANING AND ITS SCOPE[1]

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Salus populi suprema est lex

THERE has been much discussion in the medical journals and the daily press in recent months as to the purport and prospects of social medicine. In the minds of some of the profession there would appear to linger a confusion of thought as to the meaning of the term; some uncertainty even as to the underlying ideas which have prompted the discussion. The laity and members of the social services and student bodies are eagerly seeking enlightenment; less harassed and preoccupied and, perhaps, more hopeful of the future than the overworked doctor, they have sometimes appeared more receptive and understanding than the profession whose intimate concern these ideas must shortly become. The prevailing uncertainties would seem to be based upon two main misconceptions: (1) that social medicine is just another name for preventive medicine as we now know it, and (2) that social medicine and socialized (or State) medicine are synonymous. It seemed to me that it might be helpful to trace the sources of these misconceptions and to attempt a brief account of what the actual meaning and objectives of social medicine are in the view of those who have, for longer or shorter periods, insisted on the need for an evolutionary change in much of our general teaching, philosophy, and practice.

A RECENT AWAKENING

We are most of us conscious of the fact that medicine during the past quarter of a century has become (inevitably, be it allowed) not

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merely more specialized but also more technical, and that in the process—for the technicalities are often precise, intricate, and time-consuming—the old aetiological interest and humanism of our fathers have tended to take a second place. In the teaching hospitals this can scarcely be disputed. Investigation to the limit, mainly by objective methods and often with too little said to or done for the patient during or after the tedious process, has been the prevailing trend, especially in the case of the more chronic or seemingly more obscure varieties of disorder and disease. More and more accurate assessments of local pathology, with the help of more and more colleagues and instruments, and less and less intimate understanding of the patient as a whole man or woman with a home and anxieties and economic problems and a past and a future and a job to be held or lost, have become the order of the day. As we direct our students, so in large measure must the outlook and method of each new generation of doctors be determined. Over-reliance on specific objective tests; too strong a belief in the potency of certain treatments aimed at altering established disease-states or too deep a despair at the apparent unalterability of others; too little knowledge of morbidity and mortality figures, of the relative incidence of diseases in the community, of the vast prevalence of "illness" or "debility" without "physical signs" and of their several significances; too vague an appreciation of the fact that these illnesses and, indeed, many of the organic diseases have discoverable origins in social, domestic, or industrial maladjustment, in fatigue, economic insecurity, or dietary insufficiency—have not these already set their stamp upon the work and outlook of the younger generation of practitioners? And are the majority of those who teach them, most of whom have but little close acquaintance with the conditions in which their poorer hospital patients live and work, much wiser? There are notable exceptions, it is true, but their numbers dwindle. The sciences and techniques have come to dominate medicine to the exclusion of the

most important science of all—the science of man—and the most important technique of all—the technique of understanding. Science without humanism may work with atoms but it will not work with men.

In the United States, where this "mechanized" medicine has perhaps captivated the thought and action of the doctor even more than in this country, there has been a recent awakening to the need for a return to the older methods of study and assessment, the methods of the general physician—the methods which the writings of a Trousseau or an Osler were ever at pains to describe but which are often barely mentioned in modern textbooks. Canby Robinson (1939) has told how at Johns Hopkins it was found necessary to launch a new experiment with a physician and assistants to stand in a special personal relationship to the patient—a relationship which all the specialists and interns responsible for his more specific investigations and treatments somehow failed to achieve. With the aid of the trained medical social worker and with closer collaboration with the departments of public health and assistance, the interdependence of clinical, social, and environmental studies and the contribution which each can make to a better appreciation of aetiology and prognosis and to a better organization of after-care are now being taught to the student in several of the American schools. Visits are made to the environment in which illness has had its beginnings. Tuberculosis and venereal disease are being considered as human, educational, and social problems, and not merely as medical and surgical problems with their set routines for diagnosis and therapy. The neuroses and psychoneuroses, it is found, are often better helped by these new alliances than by calling yet another specialist to the bedside while the physician or surgeon, who has "excluded organic disease," retires from the scene with a sigh of relief for something accomplished—even though it was a "negative" something where the patient was concerned.

Causes of Misconception

Unprofitable trends in clinical teaching and research, educational errors at various stages in the curriculum—quite as much as its overcrowding—would indeed seem to be among the initial causes of misconception, of the failure to appreciate what social medicine, a direct development and expansion of clinical medicine, seeks to provide for the student and for the individual patient and for those closer and more useful relations between the people and their medical services which we would all like to see established. For social medicine, as its name implies, clearly has a main concern with the group as well as the individuals composing the group, with the many and varied problems created by sickness in the family and the community as a whole. The illustrations or texts for the contributions which it makes, or at present fails to make, are often to hand in the ward and out-patient clinic, and should be first presented there, but there are many larger problems to be explored "in the field."

The Third Epoch of Preventive Medicine

We are living to-day at the end of the second (or the beginning of the third) of the three great historical epochs of preventive medicine in this country. Starting a hundred years ago with Chadwick—followed a little later by Parkes and Simon, Southwood Smith and Farr—the first epoch was occupied with the disclosure of the appalling conditions in which the working classes then lived, of the prevailing lack of sanitary provisions, of the hovel-like homes, of the defective and contaminated water-supplies; of the high death rates; and with the earlier endeavors to limit the ravages of the acute infectious diseases—typhus, typhoid, smallpox, cholera, and the malignant scarlet fever of those days.

The second epoch has continued and extended the work of the first, but it has also witnessed the attack on the chronic infective diseases—tuberculosis, venereal disease, and now (we may hope),

with an improved understanding of its intimate connections with poverty and crowding and streptococcal throat infections, on rheumatic fever, which (with chorea and rheumatic heart disease) remains second only as a cause of death to phthisis between 5 and 45 in women and follows phthisis and violence in men (Morris and Titmuss, 1942).

The idea that many noninfective diseases can also be considered as preventable and so may eventually be brought within the jurisdiction of a nation's health authority has sunk more slowly into the consciousness both of the profession and of the laity. But before our eyes and in the space of four years of war we have seen the work of the great students of nutrition bear fruit, a Ministry of Food established, and our people as a whole in better health through better feeding, in spite of many shortages, than they were in times of peace. Measures to secure better standards of nutrition, better housing, and better education, and to reduce industrial fatigue and hazards (although in all these directions we still have a long way to go) have marked the beginning of our third epoch. In this period we have realized not only that many noninfective diseases (including rickets, chlorosis, other nutritional anemias, and much retarded physical and mental development) are readily preventable, but also that by preventing them and raising the general standards of health—*especially in early life*—we assist indirectly the attack on morbidity and mortality due to the diseases of infective origin (including tuberculosis and, in all probability, most of the acute infectious fevers of childhood). Universal pasteurization of milk and an extension of diphtheria immunization could carry us a stage further.

There remain, however, other diseases in plenty which must be regarded as in large degree preventable through socio-medical reforms: diseases which are associated with faulty habits of life or conditions of living; diseases too which are, in our existing order, becoming yearly more prevalent. Of such, for example, are gastric

and duodenal ulcer, now greatly on the increase, and the psychoneuroses. Peptic ulcer in the industrialized countries is competing with tuberculosis and rheumatic fever, not as a cause of mortality (although that is serious enough), but as a cause of sick-wastage, of chronic or recurring disability affecting men and women at the time of life when they should be most useful and most active and their responsibilities are greatest. It affects certain physical and temperamental types more than others: it affects all social groups, but whether equally or unequally we do not yet know. It is a disease notably of the latter half of the industrial era, the era of money-getting and money-lack, of occupational and domestic anxiety, of wars and rumors of wars, of restless living and "snack" meals and excessive tobacco consumption. Its therapeutics leave much to be desired. Its prevention has not been seriously considered. In common with other noninfective diseases it has not come within the scope of our present public health organization. What was once a relatively rare disease can, however, become so again when our work and our social and individual lives are better planned.

The same factors which have increased the incidence of peptic ulcer and a prominent group of visceral disorders commonly described as "psychosomatic" (an unsatisfactory title, since all diseases have their physical and mental components) have been partly responsible for the prevalent psychoneurosis in the community. Faults of upbringing, domestic stress, industrial fatigue, inadequate sleep and holidays, economic anxieties—factors eventually alterable by improved education, more ample accommodation for families, factory welfare, and social insurance—have also played their signficant part. In the meantime we try to cope with their consequences with bottles of medicine and certificates and a multiplication of psychiatric clinics at an ever-increasing cost to the community.

Endemic goiter persists in many rural areas along the goiter belt of England. We know that it is largely preventable and that it has

been partially controlled in other countries, but have not yet taken purposeful steps to control it in our own. Even cancer, quite apart from its occupational varieties, has its social or class differentiations, for deaths from cancers of the surface and of the stomach and upper alimentary tract are approximately twice as common in the poor as in the more privileged sections of the community. Dental disease (almost unknown in some native communities) is almost universal with us, but in its graver forms common only among the poor, and has many serious secondary consequences.

A Socio-Medical Problem

Good food and habits of feeding, good houses, better facilities for open-air activities and cleanliness, better education and cultural opportunity, holidays and social security—could they be extended to the populace as a whole—would bring benefits, both human and economic, to the individual and to the State beside which those accruing from all our remarkable advances in remedial medicine and surgery of the last century, valuable though they have been and must remain, would make but a poor showing.

The evidence for such contentions is already available in existing statistical studies of the differential mortality figures as disclosed in the Registrar-General's records relating to the five main social groupings; and mortality is only a very partial index of morbidity. Whether we consider deaths from tuberculosis or rheumatic heart disease or the infantile death rate, the figures mount steadily as they are traced from the economically favored classes to those in the lower income groups. Notwithstanding that there has been a satisfactory downward trend in infantile mortality—always a delicate index of social condition—in each of these social groups, there is some evidence for an increasing disparity in the mortality rates as between the highest and lowest groups (Titmuss, 1943). According to our national statistics for the period 1930-1932 the disparity in mortality in the first month of life as between the best and worst

economic grades was of the order of 50 per cent, but in the latter phase of post-natal life (i.e., 6 to 12 months) the difference was as great as 439 per cent. Before the war the infant death rate in some of our northern industrial cities was as much as three times that in certain suburban districts of Surrey, and British figures compared unfavorably with those from other progressive countries. The bearing of all this on national efficiency and happiness and on the population problem need scarcely be stressed. Outside the relatively small "social problem" group there is no good evidence of genetic inferiority among the poorer classes. The situation should therefore be regarded as susceptible of ultimate amendment by economic and environmental changes.

These and other cognate findings concerning the influence of class, occupation, or geography on health have been frequently reported upon by our leading statistical authorities. They are available in papers or publications by Major Greenwood, Percy Stocks, Bradford Hill, H. M. Vernon, and many others in this country, and in various reports prepared for the Medical Research Council. But the lag between discovery or demonstration and action is ever a long one. Here, however, is a socio-medical, a human, situation which we cannot lightly accept and of which we should all be more than vaguely aware. Of the mass of nonlethal disease, much of it alterable or avoidable, we have no reliable records, but the Peckham Health Center experiment (1938) and its family studies have given us a disturbing picture of the extent of urban unfitness and have suggested some of the measures which could help to lessen it. Our Towns: A Close-up (Oxford University Press, 1943) and other wartime revelations have also thrown light in dark places for the general public and for those of our profession whose particular experience has been remote from the lives of those who work in slum or factory or mine or who man the ships of our great but grimly unhygienic merchant navy. A more detailed knowledge of these things—in brief, of ultimate causes—is surely

as much due to the medical student and the practitioner as is a detailed knowledge of bacteriology or morbid anatomy. If they are ill informed, or if their own experience in the social and medical fields remains too limited or uncommunicated, how can we expect the people, as voting citizens, and their municipal or parliamentary representatives to know and act?

And how much yet remains to be done in the shape of combined medical and social inquiry! At present we have no reliable morbidity (as distinct from mortality) statistics apart from those relating to the notifiable diseases. Nor have we sifted, as carefully as we shall have to sift, the particular influences operating within the three main adversities due respectively to low economic, environmental, and educational standard. Nor have we seriously begun to study health itself within its considerable ranges of variation for age, sex, and occupation, or to determine the manifestations and standards which distinguish the individual in "full health" from the individual with "no demonstrable disease" or with early illness. We have much to learn from periodic health examinations and the study of fit groups in childhood, adolescence, and later life, and especially in the schools and Services. Growth and development in differing environments await a much fuller investigation. There is no lack of material for the student of social disease and disability, and of those states of physical, mental, and moral health or "wholeness" which must provide the target for our human planning. While disease accompanying poverty and manual toil provides a problem of far greater magnitude it should also be remembered that there are diseases of affluence or due to professional overwork and anxiety which better education and individual discipline and hygiene could conspicuously reduce. Man and his heredity, his types, and his reactions to environmental stress are inexhaustible studies.

New Training and Opportunity

But enough, perhaps, has been said to explain why social

medicine—no new concept and certainly not a new specialism, for its principles have long been germinating in the minds and reflected in the motives of all good practitioners and health officers —has required and received its new impetus; enough, too, to indicate its wide scope and that it envisages something far more comprehensive than our existing preventive medicine. It is a concern of all branches of our medical and health services, remedial and environmental, and of their ancillary services, and, among these in particular, of the hospital and municipal social worker. It must eventually invoke, through health education as an essential part of a broader general education continuing into adult life, the cooperation of the public as a whole. Its teachers, although special appointments in medical schools and institutes will be required in due course, must come to include all teachers of the main clinical subjects. Social medicine is indeed a necessary interest of the general physician, whose numbers within our schools must surely be increased and whose demonstrations could often be both clarified and amplified by fuller and more frequent references to initial or basic aetiology, and to rehabilitation and subsequent care, as an offset to concentration upon particular pathologies and immediate treatments. The cooperation between clinical teacher and hospital almoner (as social worker) in ward and clinic must become much closer.

The students and investigators of social medicine have long been active, and will continue to be found especially among the epidemiologists and medical statisticians; they will be found among the workers on human nutrition, on industrial psychology and industrial and domestic fatigue, and on maternity and child welfare; or among Service medical officers with their fine opportunities for studying large bodies of fit men or men in the process of being trained and fed to a finer level of physical and mental efficiency and resource than their civilian lives allowed; and, last but not least, among all those physicians or surgeons whose

interest has led them to the study, in home and clinic and hospital, of the broader natural history of man in disease (or health); of man as he continually reacts, emotionally and physically, not merely to the single noxious agent but to the multiple circumstances of his whole life and environment. For such as these and others with other problems our departments of social medicine will come to provide new training and opportunity.

The practitioners of social medicine will, it need hardly be said, eventually include the whole of the practising part of the profession as well as the officers of the environmental services. There is no sharp division between individual and social medicine. Health education and periodic health examination will some day supplement the remedial activities of the general practitioner, and cooperation with his colleagues of the public health service will be a far closer one than it is to-day.

The Physician's Mission

And, finally, what should be said of the confusion which has arisen in some minds between social medicine and socialized or State medicine? Although social medicine and the planning for a comprehensive medical service, through the stimulus of the times we live in, have come simultaneously under review in the medical and the general press it should be abundantly clear, from what has gone before, that social medicine has no immediate concern with medical or other politics. That it will (in common with all other scientific and educational developments having a bearing on human betterment) influence legislation and prompt reforms in the fullness of time cannot be disputed. Jenner's observations and experiments were a precursor of compulsory vaccination. Osler's teaching expedited the attack on typhoid and tuberculosis. Without Gowland Hopkins, Edward Mellanby, John Boyd Orr, and others of our own day it may be doubted whether we should have had school meals or Lord Woolton

and a Ministry of Food which—in our crowded island and in the midst of a long world war—has helped already, by legislation and organization, to improve the general state of fitness of the people.

There are those, it is true, who feel entitled to believe that social and individual medicine will find a better opportunity under a reorganized, cooperative and comprehensive medical and health service in which the uneconomic and often inequitable separations into "voluntary and municipal," "private and panel," and "preventive and remedial" services will no longer obtain. But the advocacy of changes of this kind is no more a function of social medicine than, let us say, the nationalization of the chemical industries is a function of the chemical sciences, or the framing of new regulations for the mines a duty for the Medical Research Council's Committee on Silicosis.

It may properly be argued that many of the social evils, so widely manifest by disease, which have been cited above call not for medical action but for drastic social and economic reform. For these the electorate through their representatives, and not the doctors (as doctors), must become responsible. But who unearths and exposes the evils and their secondary effects? The factual evidence, the socio-medical experience, the statistical data —all of which must be carefully and laboriously collected and analyzed—must continue to be provided by the doctors and their scientific associates and field workers and particularly by those whose concern is rather with the social than with the individual aspects of disease. Whether in this basic manner, or more immediately as an educator of opinion, or incidentally in the course of his daily professional activities, we have reached a time in which "the physician (to quote Prof. Sigerist) must assume leadership in the struggle for the improvement of conditions." Without research and teaching in social medicine to guide him he cannot faithfully fulfil his mission.

Conclusion

In summary, social medicine means what it says. It embodies the idea of medicine applied to the service of man as *socius,* as fellow or comrade, with a view to a better understanding and more durable assistance of all his main and contributory troubles which are inimical to active health and not merely to removing or alleviating a present pathology. It embodies also the idea of medicine applied in the service of *societas,* or the community of men, with a view to lowering the incidence of all preventable disease and raising the general level of human fitness.

As one who has been made responsible for the first institute of social medicine in this country and whose training and teaching for more than twenty-five years have been essentially clinical, I should like to add that I regard social medicine (for all its needful associations with public hygiene) as a logical development from and a direct expansion of clinical medicine, of medicine construed in its best Hippocratic sense and activated by the highest Hippocratic ideal; for "where there is love of man there also is love of the Art."

Of the work and intended programs at Oxford it is too soon to speak, for they are but in their infancy. Suffice it to say that the Institute already houses the Oxford Nutrition Survey and is about to house one of two experimental bureaus supported by the Nuffield Trust (the other based on Glasgow) for the collection and analysis of morbidity statistics; that it is sponsoring some studies of endemic goiter in rural England; and that its director and his colleagues have recently initiated regular socio-medical teaching and demonstrations (with the help of the hospital staff and social workers) for students in their clinical years at the Radcliffe Infirmary. Close cooperation with the Institute has been generously offered by the public health authorities of the city of Oxford and of the county. For our team of graduate assistants we

shall have to wait until demobilization provides them with their opportunity for new service and us with a new stimulus.

To those in our universities or health departments, in practice, or serving with the armed Forces who are interested in these things and in the needs of the future it seems that the ideas and tasks of social medicine may be justly regarded as essential contributions (perhaps the most essential and practical of any at present within our range) to the developing philosophy of scientific humanism. The potentialities of this philosophy are very great. Wherever our science, our faith, and unpredictable chance may lead us it can now scarcely be doubted—even while the present mad epoch of destruction continues—that we are moving upon the borders of new and possible worlds. To the rational and humane enrichment of these worlds the profession and the sciences which have the most intimate concern with man himself—a very social animal—have surely much to offer. To envisage and design a close equality of opportunity for health in the coming generations is no longer an extravagant fancy. Whether at home, in India or the colonies, or in the broader international field, it may shortly become our most urgent common interest. Nor should we forget that in our Dominions and other countries, and notably in the land of our most virile and victorious ally, there have been important experiments in social medicine and hygiene from which we have much to learn.

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SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING FERTILITY[1]

II. VARIATIONS IN THE SIZE OF COMPLETED FAMILIES OF 6,551 NATIVE-WHITE COUPLES IN INDIANAPOLIS

CLYDE V. KISER AND P. K. WHELPTON

THE purpose, scope, and general method of the study undertaken by the Committee on Social and Psychological Factors Affecting Fertility have been described in a former report.[2] Suffice it to repeat that in order to locate couples meeting highly specific requirements for inclusion in a later intensive study, a short schedule was filled out for virtually every white household in Indianapolis during the summer of 1941. All native-white couples with wife under 45 were asked to supply a few items of information, including age of wife, years married, number of times married, number of children ever born, rental value of the dwelling unit, and religion, educational attainment, and state of birth of the husband and wife. These data were used in the preceding report for an analysis of differential fertility among native-white couples in Indianapolis. Age-specific birth rates and births to wives 15-44, standardized for age, were used as indices of fertility. Some special attention was given to the rates for wives 40-44, for these could be interpreted in terms of average requirements for population replacement. The present report deals with the distributions of wives 40-44 by number of children ever born. The analysis is restricted to native-white couples in which the husband and wife were married once only and is carried through by religion of the couple,

[1] This is the second of a series of reports on a study conducted by the Committee on Social and Psychological Factors Affecting Fertility, sponsored by the Milbank Memorial Fund with grants from the Carnegie Corporation of New York. The Committee consists of Lowell J. Reed, Chairman; Daniel Katz; E. Lowell Kelly; Clyde V. Kiser; Frank Lorimer; Frank W. Notestein; Frederick Osborn; S. A. Switzer; Warren S. Thompson; and P. K. Whelpton.

[2] Whelpton, P. K. and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. I. Differential Fertility Among 41,498 Native-White Couples in Indianapolis. The Milbank Memorial Fund *Quarterly*, July, 1943, xxi, No. 3, pp. 221-280.

age of wife at marriage, rental value and tenure of the dwelling unit, educational attainment of the husband and wife, and birth region of the couple.

Despite certain manifest advantages, the fertility rates, being averages, conceal some of the operating elements that are matters of primary concern. One likes to know not only the average fertility rate of wives 40-44 but also the *distribution* of these wives by number of children ever born. Of particular interest are variations in proportions childless. The proportionate importance of the one-child family may attract those interested in the sociological and

Table 1. Distributions of native-white wives or ever-married white women 40-44 by number of live births. Indianapolis Household Survey of 1941. Indianapolis sample from 1910 Census and 1940 Census data.

Number of Children Ever Born	Indianapolis Household Survey, 1941 (Wives Aged 40–44)[1]				Indianapolis Census Sample 1910 (Wives 40–44)[2]	Total United States, 1940 (Ever-Married White Women 40–44)[3]
	Religion of Husband and Wife					
	All Religions	Both Protestant	Both Catholic	Prot.-Cath. Mixed		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total	100.0	100.1	100.0	100.1	100.1	100.0
0	18.8	18.8	14.8	25.6	13.8	15.2
1	23.2	24.0	16.6	22.4	18.9	18.7
2	23.6	24.2	20.6	20.5	19.4	21.9
3	14.7	14.4	19.3	13.0	16.2	15.3
4	8.1	7.7	11.6	7.5	12.6	10.1
5	4.5	4.3	6.8	3.6	5.6	6.4
6	2.6	2.4	4.0	3.2	4.6	4.2
7	1.6	1.5	2.7	1.0	3.4	2.9
8	1.0	1.0	1.1	1.0	2.4	2.0
9	.8	.8	.6	1.0	1.3	1.3
10 or More	1.1	1.0	1.9	1.3	1.9	2.0
Number of Wives	6,551	5,283	784	308	593	3,126,880

[1] In unbroken first marriages of native-white couples.
[2] In unbroken first marriages of white couples of native parentage. Special tabulations of punch cards from 1910 Census fertility sample.
[3] The number of ever-married white women 40–44 "reporting" on number of live births (3,126,880), as well as the distribution, is based on the experience observed in the five per cent random sample of the 1940 Census. *See:* U. S. Bureau of the Census: Population—Differential Fertility, 1940 and 1910, Washington, Government Printing Office, p. 7.

psychological problems attending the "only child." The extent to which large families are found in various socio-economic strata is of interest to those concerned with the relation of high fertility to level of living and maternal and child health. Finally, although the average fertility rates for wives 40-44 were discussed in terms of replacement requirements in the former report, students of population also like to know the approximate proportion of couples falling below these requirements.

Number of Live Births Among Native-White Couples in Indianapolis Household Survey

Among the total 6,551 native-white couples with wife 40-44 in the Indianapolis household survey, 18.8 per cent are childless (*see* column 2, Table 1). An additional 23.2 per cent have only one child and approximately the same proportion (23.6 per cent) have two children. Couples reporting three children comprise 14.7 per cent and those with four children 8.1 per cent. Approximately 12 per cent of the couples report five or more children.

It is of interest to note the proportion of wives having two or fewer, three, and four or more children, since these family sizes, in the order named, can be considered too small, approximately enough, and substantially above the average requirements for the replacement of population.[8]

Almost two-thirds (65.6 per cent) fall into the first category and

[8] As explained in the first report, with 1940 death rates, marriage rates, and divorce rates, the maintenance of a stationary population requires an average of from 245 to 315 births per 100 couples like those in the study, *i.e.*, couples in which the wife marries before age 45, her spouse was not married previously, and the marriage is not broken by death or divorce before the wife is 45. The estimates of 245 and 315 assume that women whose marriage is broken before age 45 have, respectively, *as many*, and *one-third as many* children as those whose marriage is not broken before that age. For Protestants an average of from 280 to 320 births per 100 couples probably is required, and for Catholics from 255 to 295 births. The figures are higher for Protestants than for Catholics, because the divorce rate is higher for the former. *See* Whelpton and Kiser, *ibid.*, pp. 230 and 248. (Reprint, pp. 10 and 28.)

The foregoing requirements for maintenance can be met with any one of several percentage distributions of wives by number of live births, among them the six shown below. Comparing these hypothetical distributions with those actually found in the population (shown in Tables 1 to 8) will indicate the magnitude of the changes which would

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do not come up to the average requirement for population maintenance. About 15 per cent have the three children required for maintenance and about 20 per cent have four or more, or enough to contribute to substantial population growth.

Comparison With 1940 Census Data. The distributions observed from the Indianapolis household survey may be compared with similar materials for ever-married white women 40-44 years of age in the United States as a whole. The latter, presented in column 7 of Table 1, were released recently by the Bureau of the Census, and they are based upon the experience observed in a 5 per cent random sample of the 1940 Census.[4]

Since the data for the total United States reflect a combination of rural and urban conditions, they reveal lower proportions of childless and small families than do the Indianapolis household survey data (compare columns 2 and 7 of Table 1). More specifically, the proportion of women reporting 0-2 children is lower in the

have to occur if the couples to which this report refers were to do their part in reproducing the group to which they belong.

Assumptions	Number of Live Births							Births per 100 Wives
	0	1	2	3	4	5–6	7+	
	Present proportion childless							
A	20	20	15	15	15	10	5	245
B	20	20	15	10	10	15	10	275
C	20	20	10	5	10	20	15	315
	Low proportion childless							
A	10	10	25	35	20	0	0	245
B	10	10	20	25	25	10	0	275
C	10	10	15	20	25	15	5	315

A. Assuming broken marriages are as fertile as unbroken.
B. Assuming broken marriages are two-thirds as fertile as unbroken.
C. Assuming broken marriages are one-third as fertile as unbroken.

[4] U. S. Bureau of the Census: Population—Differential Fertility, 1940 and 1910. Washington, Government Printing Office, 1943, p. 7.

1940 Census series than in the Indianapolis group. The differences run in the opposite direction in so far as proportion of women reporting any larger number of children is concerned. Among the ever-married white women 40-44 in the United States, only 15.2 per cent are reported as childless and only 55.8 per cent have 0-2 children. The corresponding figures for Indianapolis wives in unbroken marriages are 18.8 and 65.6 per cent, respectively. Among the United States women, 15.3 per cent report three children and 28.9 report four or more. The corresponding percentages for Indianapolis are 14.7 and 19.7. It should be noted that somewhat wider differences of the above character would be observed if the data for the total country were restricted to unbroken first marriages, as were the household survey data. The inclusion of broken marriages in the census series serves to lower the proportion with large families. Nevertheless, the comparison points up the relatively low fertility of the Indianapolis group.

Comparison With Indianapolis Sample Drawn From 1910 Census. For indication of trends in the size of families among native-white wives 40-44 in Indianapolis during the past thirty years, the results from the household survey may be compared with those from a sample drawn from 1910 Census records for the same city. It has been possible to extract from the 1910 urban fertility sample previously analyzed by Sydenstricker and Notestein[5] the punch cards for wives 40-44 in Indianapolis. These data are fairly comparable with those from the Indianapolis household survey. Both sets of data presented in Table 1 (columns 2 and 6) relate to children ever born to native-white couples with wife 40-44, and both are restricted to unbroken first marriages.[6]

[5] Sydenstricker, E. and Notestein, F. W.: Differential Fertility According to Social Class. *The Journal of the American Statistical Association*, March, 1930, xxv, No. 169, pp. 9-32.

[6] Perhaps the chief element of incomparability consists in the fact that whereas the household survey data relate to native-white couples, those of 1910 are further restricted to native-white couples of native parentage.

It should also be borne in mind that while the household survey represents a virtually complete coverage of all white households, except those in predominantly Negro census

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In general, comparison of the 1910 and 1941 materials indicates the expected increase in small families. Slightly over one-half of the couples in the 1910 sample, as compared with two-thirds of those in the 1941 survey, report 0-2 children. Only 13.8 per cent of the couples in the 1910 sample, as compared with 18.8 per cent in the 1941 survey, report no children. The proportion for the earlier year may be unduly low as a result of sampling deficiencies,[7] but

tracts, the 1910 data simply represent a sample drawn from the City of Indianapolis. The total number of native-white couples of native parentage in the original sample was 5,878. This is about 18 per cent of all native-white married women of native parentage reported in Indianapolis by the 1910 Census. Correction for a defined type of stratified sampling discussed below reduces the proportionate representation to about 17 per cent. On the other hand, even the former figure is itself probably below the true proportionate representation, for the sample should be compared not with the census number of native-white wives of native parentage but with the census number of unbroken first marriages in which both husband and wife were of native-white parentage. Unfortunately, this comparison is unavailable. Nevertheless, the above figures give an approximation to the sampling ratios, and these probably apply pretty closely to the wives 40-44 years of age represented in the last column of Table 1.

Examination of the distribution of the sample by enumeration districts indicated that all of the fourteen wards and virtually all of the predominantly white enumeration districts are represented in the 1910 sample for Indianapolis. The general sampling procedure for the thirty-three cities of 100,000-500,000 population in the urban fertility sample was that of beginning with the most native wards and progressing through increasingly foreign wards. This ruling, however, effected little in the way of geographic exclusion in the case of Indianapolis. In this connection, it may be noted that only 8.5 per cent of the population of Indianapolis was foreign white in 1910, and the proportion of native whites of native parentage (64.5 per cent) was higher than that of any other city of 100,000 population and over in this country in 1910. (U. S. Bureau of the Census: Thirteenth Census of the United States, 1910: POPULATION, Vol. I. Washington, Government Printing Office, 1913, pp. 177-178).

With correction for a defined type of stratified sampling, the 1910 sample is believed to be fairly representative of its universe in Indianapolis with respect to socio-economic characteristics. The stratification was simply a means of insuring an adequate sample of professional families. After records of qualifying families of any occupational status had been transcribed from one-third of the schedule pages for a given enumeration district, the remaining pages were searched for qualifying professional families only. Therefore, since the sample for the professional class was obtained from three times as many pages as that for any other class, it was given one-third its original weight in the computations for the total city presented in column 6 of Table 1. Mechanically, this was done by arranging the punch cards for the professional class (98 cases with wife 40-44 years of age) in order according to number of children ever born and selecting every third card for inclusion in the adjusted sample for Indianapolis. This reduced the total number of cards for wives 40-44 from an original 659 to 593.

[7] With regard to trends in the proportion of childlessness, however, it is pertinent to mention that according to a recent special report issued by the Bureau of the Census the proportion of ever-married white urban women 40-44 years of age reporting no children ever born was 12.8 per cent in 1910 and 17.6 per cent in 1940. (*See* U. S. Bureau of the Census: POPULATION—DIFFERENTIAL FERTILITY, 1940 AND 1910. Washington, Government Printing Office, 1943, pp. 8-11.)

there is little probability that the entire difference is due to this factor. Beyond question, there has been an increase in the proportion of small families in Indianapolis.

Comparison With a Gallup Poll of 1941. The Indianapolis household survey and the 1940 Census distributions may be compared with the results of a poll conducted by the American Institute of Public Opinion in 1941.[8] In this Gallup Poll the question was asked "What do you consider is the ideal size of family—a husband and wife and how many children?" The reported results are as follows:

1 Child	1 per cent
2 Children	31 " "
3 "	27 " "
4 "	27 " "
5 "	6 " "
6 or More "	8 " "

The above distribution shows none of the respondents considering the childless family ideal and only 1 per cent favoring the one-child family. Also striking, however, is the small proportion (only 14 per cent) of persons considering five or more children as ideal. The large majority (85 per cent) prefer the two, three, or four-child families. In contrast to this distribution of *attitudes* regarding ideal family size are those based upon the *performance* reported in the Indianapolis household survey and in the 1940 Census. The wide divergence comes from the actual incidence of childless and one-child families. Whereas only 1 per cent of the Gallup Poll respondents favor families with fewer than two children, approximately two-fifths of the native-white urban wives 40-44 years of age in the Indianapolis household survey and about one-third of all ever-married white women of this age in the 1940 Census report bearing either no child or only one child. In contrast with the 85 per cent of Gallup Poll respondents favoring 2-4 children, only 46 per cent of the household survey wives 40-44 years of age

[8] "Gallup and Fortune Polls." *Public Opinion Quarterly*, 1941, v, pp. 472-473.

and only 47 per cent of the ever-married women of this age in the 1940 Census sample report these numbers of children. The percentage of Gallup Poll respondents favoring five or more children is slightly higher than that of Indianapolis wives reporting similar numbers of live births. It is below the proportion of ever-married white women 40-44 reporting five or more live births in the 1940 Census.

Size of Family in Relation to Religion Alone

One classification available from the Indianapolis household survey, but not from the 1940 Census materials, concerns religion of the husband and wife. In this section the fertility distributions are shown by religion of the couple. In the subsequent sections the distributions are shown by other variables not only for the total population but also for the two major religious groups separately. To this extent the classification by religion runs through all the analyses. It should be emphasized, however, that the Protestant couples outnumber the others to such an extent that what is said about Protestant groups generally applies to the total population as well.

As indicated in Table 1 (columns 3-5) the lowest proportion of childlessness is that for the Catholic couples (14.8 per cent), and the highest proportion is that for the Protestant-Catholic mixed marriages (25.6 per cent).[9] The proportion for the numerically dominant group of Protestant couples is 18.8 per cent, the same as that for the total sample.[10]

The higher average fertility rate of Catholic than of Protestant couples of completed fertility (274 and 219 births per 100 wives,

[9] Of the fifty-nine Jewish couples with wife 40-44, 22.0 per cent were reported as childless. Although this sample is too small to yield statistically reliable results, the data are in line with previous findings regarding the relatively low fertility of Jewish couples at all ages of the childbearing period.

[10] Tests indicate differences of high statistical significance between the Protestant and Catholic couples and between the Protestant and Protestant-Catholic mixed marriages with

(Continued on page 80)

respectively) results not only from a lower proportion of childless women, but also from lower proportions bearing only one and two children. The proportions of couples reporting three, four, and "five or more" children are consistently higher for the Catholic than for the Protestant couples. The average fertility rate of Protestant couples (219) is somewhat higher than that of couples of mixed marriages (206). In view of the conspicuously higher proportion of childlessness among the latter group, one might expect a wider difference in the fertility rates. In comparing column 3 with column 5 of Table 1, however, one notices certain compensating influences on the fertility rate. The proportions with one and two children are smaller among the mixed marriages, and the proportions with six and nine or more are larger. Whatever may be back of the unsystematic variations, the net result is only slightly lower fertility of the mixed marriages.

The religious differentials may be summarized in terms of average requirements for population replacement. The proportions of couples reporting 0-2 live births—too few to maintain a stationary population—are: Protestant, 67 per cent; Protestant-Catholic mixed marriages, 69 per cent; and Catholic, 52 per cent. Fourteen per cent of the Protestant couples, 13 per cent of the couples of mixed religion, and 19 per cent of the Catholic couples have three children, the approximate average requirement for replacement. Only 19 per cent of the Protestant and mixed unions, as compared with 29 per cent of the Catholic unions, have the four or more children required for substantial population growth.

respect to proportion childless. As noted below, the difference in each case is larger than 2.57 σ difference, a frequently used criterion of high statistical significance.

Classes Compared	Diff. $\pm$ σ Diff.	$\frac{\text{Diff.}}{\sigma \text{ Diff.}}$
Protestant-Catholic	4.0 $\pm$ 1.2	3.3
Protestant-Mixed Marriages	6.8 $\pm$ 2.1	3.2

Variations by Age at Marriage. Interesting evidence on the relation of age of wife at marriage to number of children is available from the cross-classifications of age at enumeration and year of marriage. The data are presented for the Protestant and Catholic couples in Table 2 and Figure 1. The number of mixed marriages is too small to withstand the required breakdowns.

Table 2. Per cent distribution of wives 40-44 years of age according to number of live births, by age of wife at marriage and religion of the couple. Indianapolis Household Survey, 1941.

Religion of Couple and Age of Wife at Marriage	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	224	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
Under 17 Years	370	558	99.9	6.3	15.6	20.4	14.3	12.5	30.8
17–19 Years	282	1,787	99.9	9.3	20.5	24.3	17.4	10.8	17.6
20–22 Years	222	1,939	100.0	14.4	24.3	27.0	16.2	8.6	9.5
23–25 Years	179	1,214	100.0	22.3	27.0	24.9	14.0	5.5	6.3
26–28 Years	137	551	100.0	34.1	25.8	20.3	13.1	4.5	2.2
29–31 Years	88	248	99.9	47.6	30.2	14.1	4.4	2.4	1.2
32–34 Years	66	113	100.0	57.5	22.1	17.7	1.8	.9	—
35 Years and Over	28	132	100.1	78.0	18.2	2.3	.8	.8	—
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
Under 17 Years	366	489	100.0	6.3	16.4	20.0	14.3	12.5	30.5
17–19 Years	276	1,529	99.9	9.5	20.5	25.2	17.6	10.6	16.5
20–22 Years	207	1,567	100.1	15.4	26.4	27.6	15.2	7.7	7.8
23–25 Years	169	925	100.0	23.4	28.1	25.3	13.5	4.4	5.3
26–28 Years	129	420	99.9	36.2	24.8	21.4	12.1	4.0	1.4
29–31 Years	69	179	100.1	53.1	31.3	12.3	1.1	1.7	.6
32–34 Years	72	78	100.0	55.1	23.1	17.9	2.6	1.3	—
35 Years and Over	34	92	100.0	73.9	21.7	2.2	1.1	1.1	—
Both Catholic:									
Total[1]	274	784	100.0	14.8	16.7	20.5	19.3	11.6	17.1
Under 17 Years	394	35	100.1	5.7	8.6	28.6	20.0	8.6	28.6
17–19 Years	351	160	100.2	8.8	10.6	18.8	18.8	13.8	29.4
20–22 Years	331	235	99.9	5.5	11.9	18.3	27.2	15.3	21.7
23–25 Years	227	183	100.0	16.4	21.3	27.3	14.2	10.4	10.4
26–28 Years	191	82	100.0	20.7	28.0	15.9	19.5	9.8	6.1
29–31 Years	165	48	99.9	22.9	31.2	18.7	16.7	6.2	4.2
32–34 Years	—	18	—	—	—	—	—	—	—
35 Years and Over	—	22	—	—	—	—	—	—	—

[1] Includes cases of unknown age at marriage.

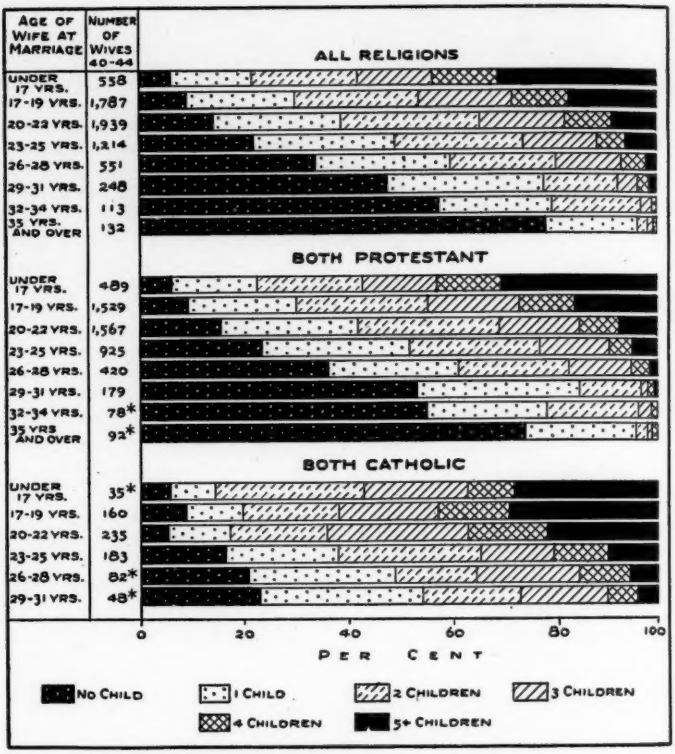


Fig. 1. Per cent of wives 40-44 years of age reporting specified numbers of live births, by age of wife at marriage and by religion of the couple. Native-white couples in the Indianapolis Household Survey. *See* Table 2.

In the total sample the proportion childless *rises* sharply with advancing age at marriage. There is an equally striking *decline* with advancing age at marriage in the proportion of families reporting five or more children. By religion, the above types of relationship are more pronounced among the Protestant than among the Catholic unions. For instance, at youngest ages at marriage, under 17, there is not much difference between the Protestant and Catholic groups with respect to proportions childless, approximately

6 per cent of each being childless. Among those marrying at ages 29-31, however, the proportion reported as childless is 53 per cent for the Protestants and 23 per cent for the Catholics.[21] In other words, among the Protestants the proportion childless is almost nine times as high at bridal ages 29-31 as at bridal ages under 17. Among the Catholics it is only about four times as high.

It should be emphasized, however, that for adequate comparisons of the above character, larger samples of Catholic couples in the specific age-at-marriage groups are needed. It should also be stated that as bridal age approaches the end of the childbearing span one would expect a diminution of religious differentials in proportion childless. The data are very inadequate for Catholic wives marrying at ages later than 32, however, so Figure 1 affords no religious comparison at these late bridal ages.[22]

Within each religious group the proportion of couples reporting five children or more declines sharply with advancing age at marriage, as would be expected. Perhaps of chief interest in this connection is the higher proportion of Catholics than of Protestants reporting five or more children when both age and age at marriage are controlled. The proportion for the Catholics is roughly two to three times as large as that for the Protestants in each age-at-marriage group with 100 or more wives.

Size of Family in Relation to Religion and Other Socio-Economic Characteristics

Variations by Rental Value of the Home. The distributions of completed families by size within successive rental classes are shown

[21] The higher proportion of childlessness among the Protestants than among the Catholics was highly significant in a statistical sense within each of the four bridal-age groups represented in the 20-31 span. In these cases the differences were two to four times as high as the σ of the difference.

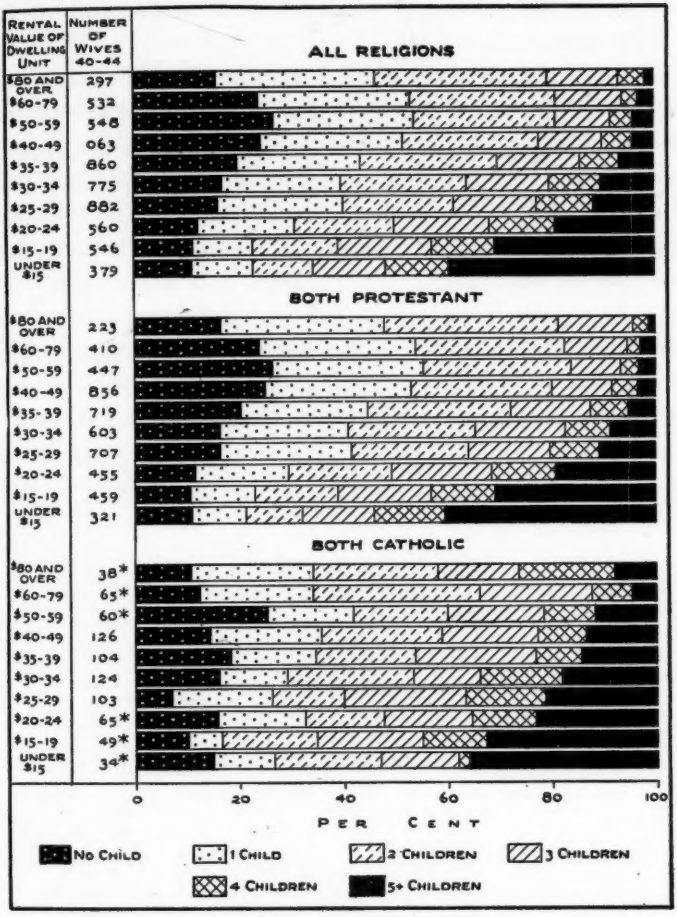
[22] It should be pointed out, however, that of the eighteen Catholic wives marrying at ages 32-34, 56 per cent are childless. Of twenty-two marrying at ages 35 and over, 86 per cent are childless. The above proportions childless are as high as or higher than those for Protestant couples of comparable bridal age, but the samples of Catholic wives are obviously much too small to afford reliable distributions.

in Table 3 and Figure 2. With respect to childlessness, it will be noted that among the Protestant couples the proportions childless follow a regular pattern complementary with the fertility differen-

Table 3. Per cent distribution of wives 40-44 years of age according to number of live births, by monthly rental value of the dwelling unit and religion of the couple. Indianapolis Household Survey, 1941.

Religion of Couple and Rental Value of Dwelling Unit	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	324	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
$80 and Over	167	297	100.0	15.8	30.6	33.3	13.5	5.1	1.7
60–79	155	532	100.0	23.9	29.1	28.2	12.6	3.0	3.2
50–59	154	548	100.0	26.6	27.2	27.6	10.0	4.4	4.2
40–49	166	1,063	100.1	24.2	27.5	26.1	12.3	5.3	4.7
35–39	193	860	99.9	19.9	23.7	26.4	15.9	7.3	6.7
30–34	222	775	100.0	16.8	22.8	24.4	16.0	9.7	10.3
25–29	232	882	100.0	16.0	24.1	21.4	16.0	10.7	11.8
20–24	284	560	100.0	12.3	18.4	19.5	18.2	12.5	19.1
15–19	363	546	100.0	11.2	11.5	16.5	17.9	12.3	30.6
Under $15	419	379	99.9	11.1	11.6	11.6	14.2	12.1	39.3
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
$80 and Over	159	223	99.9	16.6	31.4	33.6	14.3	3.1	.9
60–79	150	410	100.0	23.9	30.2	28.8	12.0	2.2	2.9
50–59	146	447	100.0	26.4	29.1	28.6	9.4	3.4	3.1
40–49	155	856	100.0	25.0	28.4	27.2	11.2	5.0	3.2
35–39	183	719	99.9	20.3	24.5	27.8	15.0	7.2	5.1
30–34	212	603	99.9	16.4	24.5	24.7	17.1	8.6	8.6
25–29	224	707	100.0	16.4	25.2	22.5	15.3	9.9	10.7
20–24	284	455	99.9	11.4	18.2	19.8	19.1	12.3	19.1
15–19	362	459	100.0	10.7	12.4	15.9	17.9	12.2	30.9
Under $15	431	321	100.0	10.9	10.3	10.9	14.0	13.4	40.5
Both Catholic:									
Total[1]	274	784	100.1	14.8	16.7	20.5	19.3	11.6	17.1
$80 and Over	237	38	100.0	10.5	23.7	23.7	15.8	18.4	7.9
60–79	212	65	99.9	12.3	21.5	32.3	21.5	7.7	4.6
50–59	212	60	100.0	25.0	16.7	18.3	18.3	10.0	11.7
40–49	244	126	100.0	14.3	21.4	23.0	18.3	9.5	13.5
35–39	252	104	100.0	18.3	16.3	19.2	23.1	8.7	14.4
30–34	277	124	99.9	16.1	12.9	24.2	12.9	16.1	17.7
25–29	312	103	100.0	6.8	19.4	13.6	23.3	15.5	21.4
20–24	317	65	100.0	15.4	16.9	15.4	16.9	12.3	23.1
15–19	390	49	100.0	10.2	6.1	18.4	20.4	12.2	32.7
Under $15	347	34	100.0	14.7	11.8	20.6	14.7	2.9	35.3

[1] Includes cases of unknown rental status.



* Distribution based on 25–99 wives.

Fig. 2. Per cent of wives 40-44 years of age reporting specified numbers of live births, by monthly rental value of the dwelling unit and by religion of the couple. Native-white couples in the Indianapolis Household Survey. *See* Table 3.

tials. Childless couples are relatively least numerous at lowest rental levels, they increase fairly consistently with rise of rental value up

through the $50-59 class, but above that rental level they again decrease in relative numbers.[18]

The proportions reporting other specific numbers of children also bear an interesting relation to rental. Among the Protestants there are fairly consistent increases with rising rental in the proportions reporting one or two live births and decreases in the proportions reporting four or "five or more" live births. The increase in the proportion of families with five or more children with lowering of rental status is especially striking. They are of negligible importance (less than 4 per cent) above the $40 rental level, and form only 10.7 per cent of the families at the $25-29 rental level, but include over 40 per cent of the families at rental levels of under $15 per month. Couples reporting three children, unlike those with

[18] An indication of the statistical significance of the differences between given rental-value classes with respect to proportions childless is afforded in the table below. The upper right section is used for Protestant couples; the lower left for Catholic couples. The symbols may be interpreted as follows:

Symbol	$\frac{\textit{Difference}}{\sigma\ \textit{Difference}}$	*P Equivalent*
VS (Very Significant)	> 2.57	$P < .01$
S (Moderately Significant)	1.96-2.57	$P = .01$-$.05$
N (Not Significant)	< 1.96	$P > .05$

To illustrate concretely, among Protestant couples the proportion childless is 23.9 per cent in the $60-79 class and 16.4 per cent in the $30-34 class. The difference is 7.5 and the computed σ of the difference is 2.2. Therefore, *difference*/σ *difference* is 3.41 well above the minimum requirement for VS rating. Hence, VS appears in the appropriate cell in the upper right section of the table.

Significance of differences between rental-value classes with respect to proportion childless among Protestants (upper right) and among Catholics (lower left).

	$80+	$60-79	$50-59	$40-49	$35-39	$30-34	$25-29	$20-24	$15-19	Under $15
$80+		S	VS	VS	N	N	N	S	S	S
60-79	N		N	N	N	VS	VS	VS	VS	VS
50-59	N	N		N	VS	VS	VS	VS	VS	VS
40-49	N	N	N		S	VS	VS	VS	VS	VS
35-39	N	N	N	N		N	S	VS	VS	VS
30-34	N	N	N	N	N		N	S	VS	S
25-29	N	N	VS	N	S	S		VS	VS	S
20-24	N	N	N	N	N	N	N		N	N
15-19	N	N	S	N	N	N	N	N		N
Under $15	N	N	N	N	N	N	N	N	N	

more or fewer, vary little in relative numbers as rent varies. The three-child family therefore forms a transitional group, in that proportions with fewer than that number increase with rising rental, whereas proportions with four or "five or more" children decrease with rising rental.

For comparisons by religion at comparable rental levels, attention may first be called to the generally lower proportions of Catholics than of Protestants reporting no children,[14] one child, and two children, *except at lowest economic levels.* Correspondingly, the proportions with four or "five or more" children are higher for Catholics than for Protestants, again except at lowest economic levels.

Attention has been called to the systematic variations with rental in the proportions of Protestants with specific numbers of children. This is not matched among Catholic couples except in so far as proportions with "five or more" children are concerned. There is, for instance, not much in the way of systematic relation of proportion childless to rental value of the home. It is possible that small numbers of Catholic couples in given rental classes account for irregularities in these proportions. On the other hand, these same samples yield a systematic variation in proportions reporting five children or more. These percentages extend from about 5 per cent in the $60-79 rental group to 35 per cent in the "under $15" group.

Variations by Tenure and Rental Value. The distribution of Protestant couples by number of live births is shown for tenure and rental-value groups in Table 4 and Figure 3. The *direct* association between the proportion childless and rental value is manifested somewhat more consistently by the renters than by the owners. The *direct* association between the proportion of one-child families and rental value is likewise a little sharper among the renters than

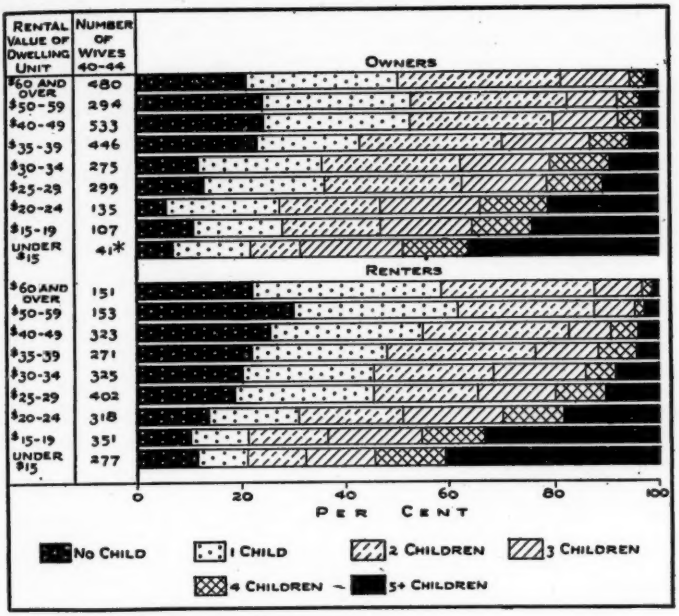
[14] Only within three rental-value groups, however, was the difference between the Protestant and Catholic couples with respect to proportions childless greater than 2 σ of the difference. These were $60-79, $40-49, and $25-29. Within some of the remaining groups, of course, lack of significance simply reflects too small a universe.

among the owners. The *inverse* relation of the proportion of larger families (five or more children) to rental value is prominent for the owners and renters, but the range of the variations is somewhat wider for the latter.

If the 480 Protestant owners in the "$60 and Over" group of Table 4 are subdivided into the 291 and 189 with rental values of "$60-79" and "$80 and Over," respectively, the differences previously observed in Table 3 for all tenure groups are found in greater degree. The proportion childless is 14.3 for the top group compared with 25.4 for the second. The striking contrast probably is due in part to selection, home-owning couples without children being less likely to have a dwelling with a rental value of $80 or over than

Table 4. Per cent distribution of Protestant couples with wife 40-44 years of age according to number of live births, by tenure and rental value of the dwelling unit. Indianapolis Household Survey, 1941.

Tenure and Rental Value of Dwelling Unit	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
Owners:									
Total	197	2,621	100.0	18.6	25.4	26.9	15.0	6.9	7.2
$60 and Over	157	480	100.0	21.0	29.2	30.8	14.0	2.5	2.5
50–59	153	294	100.0	24.5	27.9	29.9	10.2	4.1	3.4
40–49	157	533	100.0	24.6	28.0	26.8	13.1	4.9	2.6
35–39	191	446	100.0	19.3	23.3	27.6	16.8	7.4	5.6
30–34	228	275	99.9	12.0	23.6	26.5	17.1	11.6	9.1
25–29	234	299	100.0	13.0	23.4	26.1	16.1	10.4	11.0
20–24	304	135	100.1	5.9	21.5	19.3	19.3	12.6	21.5
15–19	326	107	100.0	11.2	16.8	18.7	17.8	11.2	24.3
Under $15	378	41	100.0	7.3	14.6	9.8	19.5	12.2	36.6
Renters:									
Total	243	2,593	99.9	18.7	22.1	21.6	14.0	8.5	15.0
$60 and Over	137	151	100.0	22.5	35.8	29.1	9.3	2.0	1.3
50–59	132	153	100.0	30.1	31.4	26.1	7.8	2.0	2.6
40–49	152	323	100.0	25.7	29.1	27.9	8.0	5.3	4.0
35–39	170	271	99.9	22.1	25.8	28.4	12.2	7.0	4.4
30–34	198	325	99.9	20.3	24.9	23.4	17.2	5.8	8.3
25–29	216	402	100.0	18.9	26.4	19.7	14.9	9.7	10.4
20–24	275	318	99.9	13.8	17.0	20.1	18.9	11.9	18.2
15–19	373	351	99.8	10.5	10.8	15.1	17.9	12.5	33.0
Under $15	435	277	100.2	11.6	9.4	11.2	13.4	13.4	41.2



* Distribution based on 25–99 wives.

Fig. 3. Per cent of wives 40-44 years of age in Protestant unions reporting specified numbers of live births, by tenure and monthly rental value of the dwelling unit. Native-white Protestant couples in the Indianapolis Household Survey. *See* Table 4.

similar couples with children. Another explanation might be dissimilar proportions of sterile couples, but a difference between the groups in this respect is not likely except as a result of the selective factor just mentioned. It is also probable that people who can afford to own homes worth $8o or more either have a greater desire for children than those owning less expensive homes, or are less constrained by financial reasons to be childless. Any greater desire for children, or willingness to meet the cost of rearing a family, appears to be easily satisfied, however, for the "$8o and Over" owners exceed other groups only in proportions with one or two children. They stand at or near the bottom of the lists of rental-

value groups ranked according to proportions with three, four, and "five or more" children.

At each rental-value level except $15-19 the renters surpass the owners with respect to proportion childless; they fall below the owners with respect to proportion with five or more children except in the two lowest rental groups and at $40-49. This means that when rental value is held constant the owners tend to have higher average fertility rates. Selective factors may be partially responsible, however. Among couples of similar economic status, those without children are perhaps least likely to purchase a home.

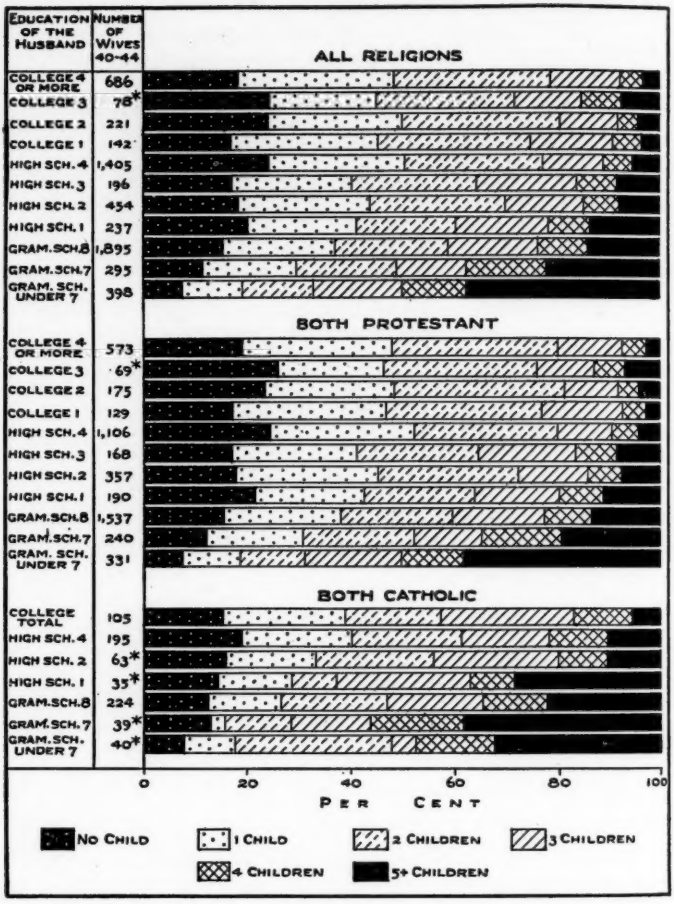
Among the owners, only those in the three lowest rental-value groups (under $25) have a sufficiently high proportion of large families to maintain a stationary population. In higher rental-value groups small families are much too numerous, and large families much too rare. Among the renters, those in the $20-24 group are on the borderline, while those paying higher rents include far too many small families and too few large ones for replacement requirements.

Variations by Educational Attainment. In the detailed classification by education of the husband or the wife, there is a tendency for fertility rates to rise with lowering of educational attainment. Among Protestants this inverse relation is most pronounced below the high school level. There are wide differences with respect to fertility between "Under 7th Grade" and 7th grade groups and between the 7th and 8th grade groups. The interclass differences in fertility are of slighter magnitude at higher levels of educational attainment. This type of contrast holds true when the education of either the husband or the wife is considered. The High School 1, 2, and 3 groups are seen to be more fertile than the High School 4 and College groups, but within each of these two combinations the interclass differences in fertility are of small magnitude. The position of the "High School 4" group is noteworthy in this connection. With respect to fertility, it ranks with the college groups

Table 5. Per cent distribution of wives 40-44 years of age according to number of live births, by educational attainment of the husband and religion of the couple. Indianapolis Household Survey, 1941.

Religion of Couple and Education of Husband	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	224	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
College Total[2]	170	1,164	100.1	20.3	28.2	29.4	13.3	5.0	3.9
College 4 or More	170	686	100.1	18.5	29.9	30.0	13.6	4.7	3.4
College 3	183	78	100.0	24.4	20.5	26.9	12.8	7.7	7.7
College 2	163	221	100.0	24.0	26.2	30.3	10.9	4.1	4.5
College 1	179	142	100.0	16.9	28.2	29.6	16.2	5.6	3.5
High School Total[2]	185	2,506	100.0	22.9	24.9	25.2	13.4	6.5	7.1
High School 4	171	1,405	100.1	24.5	26.0	26.7	11.5	5.8	5.6
High School 3	210	196	100.1	17.3	23.0	24.0	19.4	7.7	8.7
High School 2	201	454	100.0	18.3	25.6	26.0	15.0	7.0	8.1
High School 1	236	237	100.0	20.3	20.7	19.4	17.7	8.0	13.9
Grammar School Total[2]	284	2,725	100.1	14.2	19.2	19.9	16.7	10.9	19.2
Grammar School 8	250	1,895	100.1	15.7	21.5	21.5	17.3	9.7	14.4
Grammar School 7	314	295	100.1	11.5	18.0	19.3	13.6	15.3	22.4
Grammar School Under 7	411	398	100.0	7.8	11.3	13.8	17.3	12.1	37.7
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
College Total[2]	166	968	100.0	20.7	27.4	31.3	12.6	4.4	3.6
College 4 or More	166	573	100.0	19.2	28.8	31.9	12.7	4.4	3.0
College 3	172	69	100.0	26.1	20.3	29.0	11.6	5.8	7.2
College 2	164	175	100.0	23.4	25.1	32.6	10.3	4.0	4.6
College 1	174	129	100.1	17.1	29.5	30.2	15.5	4.7	3.1
High School Total[2]	177	1,976	100.0	22.9	26.5	25.8	12.6	6.1	6.1
High School 4	162	1,106	100.1	24.7	27.7	27.5	10.6	5.1	4.5
High School 3	211	168	99.9	17.3	23.8	23.2	19.0	7.7	8.9
High School 2	194	357	100.0	17.9	27.5	26.9	13.4	6.7	7.6
High School 1	223	190	100.1	21.6	21.1	21.1	16.3	8.4	11.6
Grammar School Total[2]	279	2,216	100.0	14.3	19.8	20.0	17.0	10.4	18.5
Grammar School 8	245	1,537	100.0	15.9	22.3	21.5	17.4	9.2	13.7
Grammar School 7	298	240	100.1	12.1	18.8	21.3	12.9	15.4	19.6
Grammar School Under 7	412	331	100.1	7.6	11.2	12.4	18.7	11.8	38.4
Both Catholic:									
Total[1]	274	784	100.0	14.8	16.7	20.5	19.3	11.6	17.1
College Total[2]	221	105	99.9	15.2	23.8	18.1	25.7	11.4	5.7
College 4 or More	221	61	100.0	11.5	29.5	18.0	26.2	8.2	6.6
College 3	—	4	—	—	—	—	—	—	—
College 2	—	24	—	—	—	—	—	—	—
College 1	—	9	—	—	—	—	—	—	—
High School Total[2]	239	350	100.1	17.7	18.9	20.9	19.7	10.3	12.6
High School 4	224	195	100.0	19.0	21.0	21.0	16.9	11.3	10.8
High School 3	—	17	—	—	—	—	—	—	—
High School 2	248	63	100.0	15.9	17.5	22.2	23.8	9.5	11.1
High School 1	323	35	100.1	14.3	14.3	8.6	25.7	8.6	28.6
Grammar School Total[2]	330	315	99.9	11.7	12.1	20.6	16.2	13.3	26.0
Grammar School 8	304	224	99.9	12.5	13.8	20.5	18.3	12.5	22.3
Grammar School 7	423	39	100.0	12.8	2.6	12.8	15.4	17.9	38.5
Grammar School Under 7	378	40	100.0	7.5	10.0	30.0	5.0	15.0	32.5

[1] Includes cases of unknown educational attainment.
[2] Includes cases that could be coded only with reference to given broad educational class.



* Distribution based on 25–99 wives. Distributions based on fewer cases are not shown.

Fig. 4. Per cent of wives 40-44 years of age reporting specified numbers of live births, by educational attainment of the husband and by religion of the couple. Native-white couples in the Indianapolis Household Survey. *See* Table 5.

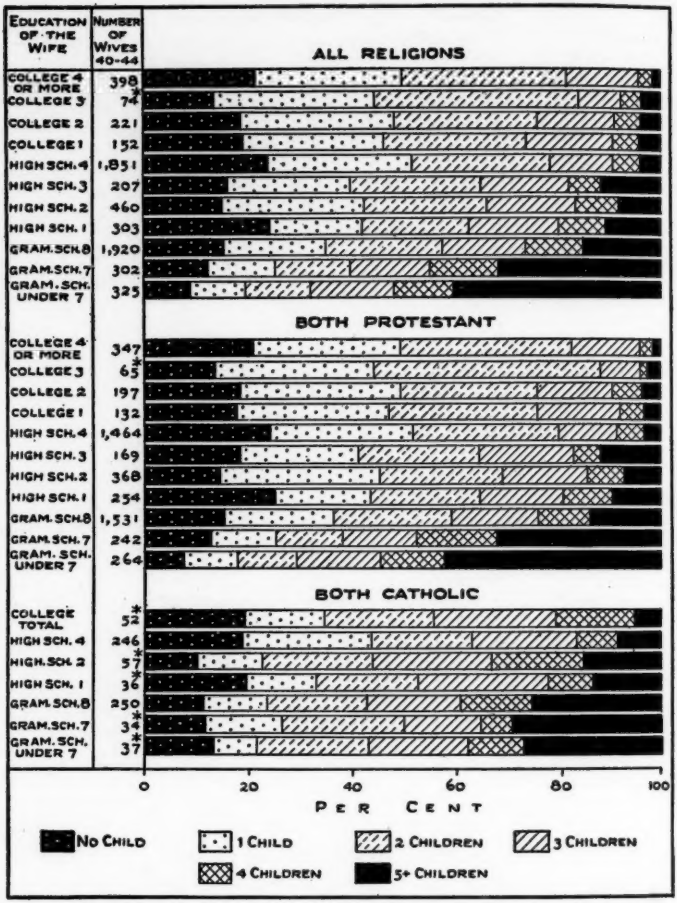
rather than with the remaining high school groups, again on the basis of educational attainment of either the husband or the wife.

The distributions of couples by number of live births, of course,

Table 6. Per cent distribution of wives 40-44 years of age according to number of live births, by educational attainment of the wife and religion of the couple. Indianapolis Household Survey, 1941.

Religion of Couple and Education of Wife	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	224	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
College Total[2]	166	878	99.8	19.9	28.2	30.4	14.1	4.4	2.8
College 4 or More	156	398	100.0	21.4	28.1	31.9	14.1	3.0	1.5
College 3	170	74	100.1	13.5	31.1	39.2	8.1	4.1	4.1
College 2	174	221	100.0	18.6	29.9	27.1	14.9	5.4	4.1
College 1	182	152	100.0	19.1	27.0	27.6	16.4	5.3	4.6
High School Total[2]	183	2,997	100.0	22.3	26.1	25.0	13.6	6.5	6.5
High School 4	165	1,851	99.9	24.0	27.5	26.2	12.1	5.7	4.4
High School 3	225	207	100.0	16.4	23.2	25.1	16.9	6.3	12.1
High School 2	213	460	100.1	15.0	27.4	23.5	17.0	8.3	8.9
High School 1	221	303	100.0	24.1	17.8	20.5	17.2	9.2	11.2
Grammar School Total[2]	292	2,596	100.1	14.3	17.8	19.8	16.3	11.2	20.7
Grammar School 8	260	1,920	100.0	15.5	19.7	21.8	16.5	10.7	15.8
Grammar School 7	353	302	100.0	12.3	12.9	14.6	15.2	13.2	31.8
Grammar School Under 7	430	325	100.0	8.9	10.8	12.3	16.0	11.7	40.3
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
College Total[2]	165	764	100.0	19.5	28.8	31.2	13.7	3.9	2.9
College 4 or More	156	347	99.9	21.0	28.2	32.6	13.8	2.6	1.7
College 3	162	65	100.0	13.8	30.8	43.1	7.7	1.5	3.1
College 2	174	197	100.1	18.8	30.5	26.4	14.2	5.6	4.6
College 1	174	132	100.0	18.2	28.8	28.8	15.9	4.5	3.8
High School Total[2]	176	2,366	100.0	22.6	26.9	25.7	13.0	6.0	5.8
High School 4	160	1,464	100.0	24.2	27.7	27.8	11.2	5.3	3.8
High School 3	223	169	100.0	18.3	23.1	23.1	17.8	5.3	12.4
High School 2	203	368	100.0	14.7	30.4	23.6	16.3	7.1	7.9
High School 1	212	254	100.0	25.2	18.1	20.9	16.5	9.1	10.2
Grammar School Total[2]	289	2,075	99.9	14.2	18.4	20.0	16.3	11.0	20.0
Grammar School 8	251	1,531	100.0	15.6	20.8	22.6	16.6	10.1	14.3
Grammar School 7	361	242	100.0	12.8	12.4	12.8	14.5	14.9	32.6
Grammar School Under 7	446	264	100.0	7.6	10.2	11.4	15.9	12.5	42.4
Both Catholic:									
Total[1]	274	784	100.0	14.8	16.7	20.5	19.3	11.6	17.1
College Total[2]	227	52	100.1	19.2	15.4	21.2	23.1	15.4	5.8
College 4 or More	—	24	—	—	—	—	—	—	—
College 3	—	5	—	—	—	—	—	—	—
College 2	—	7	—	—	—	—	—	—	—
College 1	—	10	—	—	—	—	—	—	—
High School Total[2]	234	396	100.0	17.2	21.2	20.5	19.9	10.1	11.1
High School 4	212	246	99.9	18.7	25.2	19.1	19.9	8.1	8.9
High School 3	—	22	—	—	—	—	—	—	—
High School 2	298	57	100.0	10.5	12.3	21.1	22.8	17.5	15.8
High School 1	264	36	99.9	19.4	13.9	19.4	25.0	8.3	13.9
Grammar School Total[2]	329	326	100.1	11.7	11.7	19.9	17.8	12.9	26.1
Grammar School 8	326	250	100.0	11.6	12.0	19.2	18.0	13.6	25.6
Grammar School 7	315	34	100.0	11.8	14.7	23.5	14.7	5.9	29.4
Grammar School Under 7	351	37	99.9	13.5	8.1	21.6	18.9	10.8	27.0

[1] Includes cases of unknown educational attainment.
[2] Includes cases that could be coded only with reference to given broad educational class.



* Distribution based on 25–99 wives. Distributions based on fewer cases are not shown.

Fig. 5. Per cent of wives 40-44 years of age reporting specified numbers of live births, by educational attainment of the wife and by religion of the couple. Native-white couples in the Indianapolis Household Survey. *See* Table 6.

underlie the general pattern described above. These are shown by detailed educational attainment of the husband in Table 5 and Figure 4, by detailed educational attainment of the wife in Table 6

and Figure 5, and by broad educational attainment of the couple in Table 7 and Figure 6. Attention may first be given to the distributions within detailed educational classes of each spouse, Figures 4 and 5. In the group of Protestant couples (middle panels) there are sharp declines in proportions childless, and sharp rises in proportions of large families with decreasing amount of educational attainment *below the high school level.* Above this level there is little in the way of systematic increase in proportion childless with improvement of educational attainment.[18] The highest frequency of childlessness, for instance, is not found for the "College 4" groups on the basis of the educational attainment of either the husband or wife. Furthermore, although not always highest, the frequency of childlessness among the "High School 4" groups surpasses that for the "College 4" groups regardless of whether the

[18] The significance of the difference between given educational classes of Protestant couples with respect to childlessness is summarized in the following table by the use of symbols, VS (Very Significant), S (Significant), and N (Not Significant). The criteria for these ratings are described in footnote 13.

The cells in the upper right section relate to husband's education; those below to wife's education. A similar table for Catholics would contain N in all cells except H.S.4-G.S.8 (wife's education), which would be S.

Significance of differences between educational classes of Protestant couples with respect to proportion childless, shown on the basis of the husband's education (upper right) and on the basis of the wife's education (lower left).

	College				High School				Grammar School		
	4+	3	2	1	4	3	2	1	8	7	Under 7
College 4+		N	N	N	S	N	N	N	N	S	VS
College 3	N		N	N	N	N	N	N	S	VS	VS
College 2	N	N		N	N	N	N	N	S	VS	VS
College 1	N	N	N		N	N	N	N	N	N	VS
H. S. 4	N	N	N	N		S	S	N	VS	VS	VS
H. S. 3	N	N	N	N	N		N	N	N	N	VS
H. S. 2	S	N	N	N	VS	N		N	N	N	VS
H. S. 1	N	S	N	N	N	N	VS		S	VS	VS
G. S. 8	S	N	N	N	VS	N	N	VS		N	VS
G. S. 7	S	N	N	N	VS	N	N	VS	N		N
G. S. Under 7	N	N	VS	VS	VS	VS	VS	VS	VS	N	

education of the husband or wife is considered.[16] It may be that differences of the above character reflect less inclination of the college graduates to remain childless altogether. Whatever the explanation may be, the difference is compensated by a slightly higher proportion reporting five or more children in the "High School 4" than in the "College 4" groups.

Two main points may be made regarding comparisons by religion in Figures 4 and 5. In the first place, it will be noted that at each educational level except the lowest, the Catholic couples tend to surpass the Protestant couples with respect to proportions with four or "five or more" live births and to fall below with respect to proportions reporting no children,[17] one child, and two children. In the second place, the relation between educational attainment and number of children appears to be a little more systematic among Protestant than among Catholic couples. To some extent, of course, this is due to erratic results derived from small numbers of Catholic wives 40-44. On the other hand, the more adequate numbers of wives 15-44 also indicate that the range of variations of standardized fertility rates by education of the husband or wife is not nearly so wide among Catholic as among Protestant couples.[18]

The data for each spouse separately may be summarized in terms of three broad educational classes (total college, total high school, and total grammar school), given in Tables 5 and 6. On the basis of the husband's education, Table 5, the proportion childless is lowest, and the proportion with five or more children is highest for the grammar school group. The highest proportions of child-

[16] As mentioned earlier, the proportion of Protestant couples among those studied is so high that what is said about them applies almost equally well to all religious groups combined.

[17] Within none of the educational groups listed for Catholics in Figures 4 and 5, however, was the difference between Protestant and Catholic couples with respect to proportions childless as high as 2 σ difference. Within the "High School 4" group (husband's education), however, the Protestant-Catholic difference attained a moderate degree of significance of 5.7 ± 3.3 σ difference. At this same educational level, on the basis of the wife's schooling, the Protestant-Catholic difference in proportion childless was 5.5 ± 3.0 σ difference.

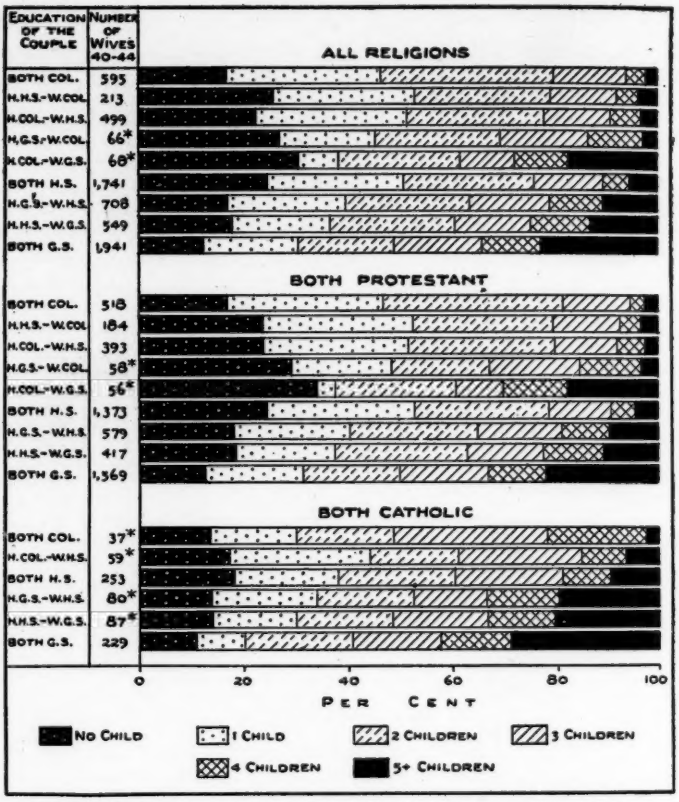
[18] Whelpton and Kiser, *op. cit.*, pp. 262-263. (Reprint, pp. 42-43.)

lessness are not found for the groups of college status, but for those of high school attainment. The high school groups, however, also surpass those of college attainment with respect to proportions having five or more children. The above generalizations hold true for the Catholic as well as for the Protestant unions. With one

Table 7. Per cent distribution of wives 40-44 years of age according to number of live births, by educational attainment and religion of the couple. Indianapolis Household Survey, 1941.

Religion and Education of Couple	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	224	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
Both College	168	595	100.0	17.0	29.7	32.8	14.1	3.9	2.5
H. H.S.—W. Col.	156	213	100.0	25.8	27.2	26.3	12.7	4.2	3.8
H. Col.—W. H.S.	164	499	100.0	22.8	29.1	26.1	12.8	5.6	3.6
H. G.S.—W. Col.	183	66	100.0	27.3	18.2	24.2	16.7	10.6	3.0
H. Col.—W. G.S.	231	68	100.0	30.9	7.4	23.5	10.3	10.3	17.6
Both High School	171	1,741	100.0	24.2	26.4	25.4	13.2	5.3	5.5
H. G.S.—W. H.S.	226	708	99.9	16.9	23.0	23.6	15.4	10.0	11.0
H. H.S.—W. G.S.	241	549	100.1	17.9	18.9	23.9	14.8	11.1	13.5
Both Grammar School	308	1,941	100.0	12.7	17.8	18.4	17.1	11.2	22.8
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
Both College	166	518	100.0	16.8	29.9	34.4	13.3	2.9	2.7
H. H.S.—W. Col.	155	184	99.9	23.9	28.8	26.6	13.0	4.3	3.3
H. Col.—W. H.S.	157	393	99.9	23.9	27.5	28.2	12.2	5.3	2.8
H. G.S.—W. Col.	185	58	100.0	29.3	19.0	19.0	17.2	12.1	3.4
H. Col.—W. G.S.	236	56	100.0	33.9	3.6	23.2	8.9	12.5	17.9
Both High School	164	1,373	100.1	24.2	28.5	25.8	11.9	4.7	5.0
H. G.S.—W. H.S.	219	579	100.0	17.8	22.6	24.4	16.1	9.3	9.8
H. H.S.—W. G.S.	232	417	99.9	18.2	19.2	25.4	14.6	11.5	11.0
Both Grammar School	305	1,569	100.0	12.4	18.8	18.5	17.2	10.8	22.3
Both Catholic:									
Total[1]	274	784	100.1	14.8	16.7	20.5	19.3	11.6	17.1
Both College	232	37	99.9	13.5	16.2	18.9	29.7	18.9	2.7
H. H.S.—W. Col.	—	9	—	—	—	—	—	—	—
H. Col.—W. H.S.	217	59	99.9	16.9	27.1	16.9	23.7	8.5	6.8
H. G.S.—W. Col.	—	6	—	—	—	—	—	—	—
H. Col.—W. G.S.	—	9	—	—	—	—	—	—	—
Both High School	224	253	100.0	18.2	19.8	22.1	20.9	9.5	9.5
H. G.S.—W. H.S.	284	80	100.2	13.8	20.0	18.8	13.8	13.8	20.0
H. H.S.—W. G.S.	284	87	100.0	13.8	16.1	18.4	18.4	12.6	20.7
Both Grammar School	351	229	99.9	10.9	9.2	20.5	17.0	13.5	28.8

[1] Includes cases of unknown educational attainment of the husband or wife.



* Distribution based on 25–99 wives. Distributions based on fewer cases are not shown.

Fig. 6. Per cent of wives 40-44 years of age reporting specified numbers of live births, by educational attainment and religion of the couple. Native-white couples in the Indianapolis Household Survey. *See* Table 7.

exception, due possibly to chance variations,[19] they can be made for each religious group in so far as educational attainment of the wife is concerned.

The summary just given in terms of broad educational attainment of the husband can be made on the basis of the joint classifica-

[19] The proportion childless was a little higher for the Catholic wives reporting college attendance than for those of high school status.

tion if the comparison is restricted to the "Both College," "Both High School," and "Both Grammar School" groups (Table 7 and Figure 6). Among Protestants and Catholics, the "Both Grammar School" group exhibits the lowest proportion childless and the highest proportion with five or more children. Likewise, the "Both High School" group surpasses the "Both College" group with respect to proportion childless and also proportion with five or more children. In the total sample the proportions childless for the three educational groups are "Both College," 17.0 per cent; "Both High School," 24.2 per cent; and "Both Grammar School," 12.7 per cent. The proportions with five or more children in these three groups are 2.5, 5.5, and 22.8 per cent, respectively.

There are several further points of interest in the data based upon the joint classification. It will be noted that the proportion childless among the college-high school marriage combinations is higher than that for the "Both College" group and about the same as that for the "Both High School" group. The proportion childless among the high school-grammar school combinations falls about midway between that for the "Both High School" and that for the "Both Grammar School" couples. Among Protestants the proportions childless are highest of all for the two college-grammar school combinations shown in Figure 6, but chance variations associated with small numbers are doubtless involved.[20]

The one and two-child families are proportionately more important within the "Both College" than within the "Both High School" groups. Families of this size include 63 per cent of the "Both College," 52 per cent of the "Both High School," and 36 per cent of the "Both Grammar School" couples, all religions combined.

The religious differentials exhibited in Figure 6 lead to approxi-

[20] The excesses in proportions childless among the "H.G.S.-W.C." and "H.C.-W.G.S." groups over that of other groups are found to be significant to the extent of being greater than 2 σ difference only in comparisons with the "Both College," "H.G.S.-W.H.S.," "H.H.S.-W.G.S.," and "Both G.S." groups.

mately the same generalization that was made on the basis of Figures 4 and 5. In the joint classification, however, at each educational level except one, the Catholic couples surpass the Protestant couples with respect to the proportion reporting five or more live births and fall below with respect to the proportion childless.[21] The exception is the "Both College" group, represented by 37 Catholic couples.

Distributions by Birth Region of the Couple. As in the previous report,[22] the state of birth data obtained in the household survey were utilized for establishing the following classes:

Husband and wife born in North
Husband born in North—wife born in South
Husband born in South—wife born in North
Husband and wife born in South

Owing to the small number of non-Protestants of southern origin, however, the full classification was adaptable only to the "Both Protestant" couples.

It will be noted that among Protestant couples the average fertility rate by birth region is lowest for the "Both North" group and highest for the "Both South" group (Table 8). The marriages of mixed regional nativity fall in intermediate position, but the "Husband North-Wife South" marriages are substantially less fertile than the "Husband South-Wife North" unions. (Figure 7).

On the basis of distribution by number of live birth, it is seen that the lower average fertility rate of the "Both North" than of the "Husband North-Wife South" or "Husband South-Wife North" groups arises from larger proportions of families with one or two children and smaller proportions with four or more. Contrary to expectations the proportion childless is lower in the "Both North" group than in the "Husband North-Wife South"[23] group and prac-

[21] Only for the "Both H.S." groups, however, is the Protestant-Catholic difference in proportion childless as much as 2 σ difference. For these groups the difference is 6.0 $\pm$ 2.9 σ.

[22] Whelpton and Kiser, *op. cit.*, p. 264. (Reprint, p. 44.)

[23] The difference between the "Both North" and "Husband North-Wife South" groups

(Continued on page 101)

Religion and Birth Region of Couple	Births per 100 Wives 40–44	Number Wives 40–44	Per Cent Distribution by Number of Children						
			Total	No Children	1 Child	2 Children	3 Children	4 Children	5 or More Children
All Religions:									
Total[1]	224	6,551	100.1	18.8	23.2	23.6	14.7	8.1	11.7
Both North	216	5,173	100.1	19.0	23.8	24.3	14.7	7.7	10.6
H. North—W. South	234	358	100.0	22.3	20.4	20.1	13.1	10.1	14.0
H. South—W. North	254	387	100.0	19.4	17.3	20.9	18.1	10.9	13.4
Both South	308	430	100.1	11.2	19.3	19.8	14.2	10.7	24.9
Both Protestant:									
Total[1]	219	5,283	99.9	18.8	23.9	24.2	14.3	7.7	11.0
Both North	209	4,121	99.9	19.1	24.9	25.1	14.1	7.2	9.5
H. North—W. South	223	297	100.0	23.2	20.2	20.9	13.8	9.1	12.8
H. South—W. North	255	326	100.0	19.0	17.2	21.5	18.1	10.7	13.5
Both South	316	387	100.0	10.6	18.6	19.6	15.0	10.1	26.1
Both Catholic:									
Total[1]	274	784	100.0	14.8	16.7	20.5	19.3	11.6	17.1
Both North	272	672	100.0	14.9	17.0	19.9	19.9	11.0	17.3
H. North—W. South	332	34	100.1	5.9	20.6	26.5	11.8	14.7	20.6
H. South—W. North	250	30	100.0	20.0	16.7	20.0	13.3	20.0	10.0
Both South	—	16	—	—	—	—	—	—	—

[1] Includes cases of unknown region of birth of the husband or wife.

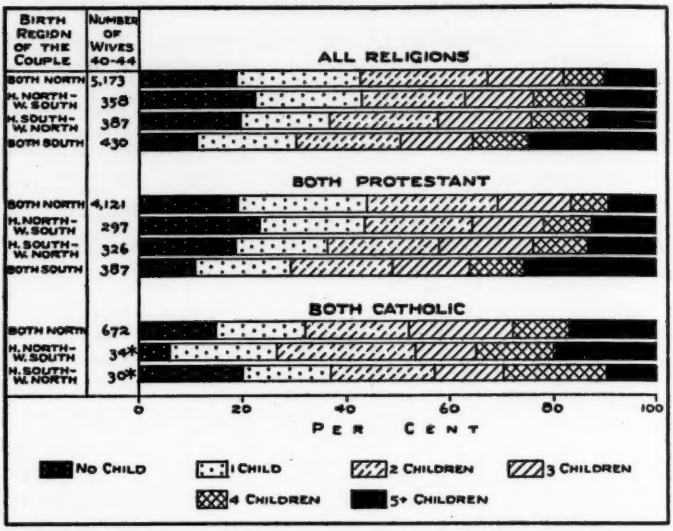
Table 8. Per cent distribution of wives 40-44 years of age according to number of live births, by birth region and religion of the couple. Indianapolis Household Survey, 1941.

tically the same as that in the "Husband South-Wife North" group.

In the comparisons by region of birth the "Both South" group is conspicuous for its low proportion childless[24] and high proportion with five or more children. The northern-born Catholic couples rank about midway between the northern-born and southern-born

with respect to proportion childless is almost twice the σ of the difference, 4.1 $\pm$ 2.2 σ difference. Virtually the same difference, but a much lower degree of reliability, is found in the "Husband North-Wife South" and "Husband South-Wife North" comparison (4.2 $\pm$ 3.2 σ difference).

[24] The lower proportion of childless families among the "Both South" group than among any other birth-region group of Protestant couples is statistically significant to a high degree. The following differences $\pm$ σ difference are found in the comparisons with the "Both South" group: "Both North," 8.5 $\pm$ 2.2 σ; "Husband North-Wife South," 12.6 $\pm$ 2.8 σ; "Husband South-Wife North," 8.4 $\pm$ 2.7 σ. The lower proportion of childlessness among the "Both South" Protestant group than among all Catholic couples in the sample is smaller in magnitude and in degree of significance (4.2 $\pm$ 2.2 σ difference), but it is almost twice the σ of the difference.



* Distribution based on 25–99 wives. Distributions based on fewer cases are not shown.

Fig. 7. Per cent of wives 40-44 years of age reporting specified numbers of live births, by birth region and religion of the couple. *See* Table 8.

Protestant couples with respect to proportion childless and proportion with five or more children.

Relation to Subsequent Reports

The data presented above show that there are wide variations in size of family within population groups, and that these variations differ greatly from group to group. The important question is why do they occur. Is the physiological ability to reproduce (fecundity) substantially higher among some groups than others? Or are there wide differences in the extent and effectiveness of the use of contraceptives? If such differences exist, what proportion of the pregnancies are accidental, and how much of a reduction in size of family is to be expected if more effective contraceptives are used? If variations in size of family occur among couples practicing contraception effectively (as is undoubtedly the case), what are

the reasons for them? To what extent does it seem likely that the size of these families could be influenced by measures designed to encourage population growth, perhaps like those in Sweden?

So far, the preliminary analysis of the data from the intensive study permits a tentative answer to only one of these questions. Of the Protestant couples in the detailed study, almost all had practiced some form of contraception. Information relating to the other questions, together with an analysis of the effectiveness of the contraceptive methods tried, will be presented in subsequent reports.

Summary

The household survey conducted in Indianapolis in the summer of 1941, as a necessary prelude to a more intensive investigation of social and psychological factors affecting fertility, affords demographic data for virtually all native-white couples with wife 15-44. The average fertility rates standardized for age were presented in a former report for subdivisions by religion and socio-economic status. In that report some special attention was given to fertility rates for wives 40-44, for such indices could be interpreted in terms of requirements for permanent maintenance of the population through births.

The present report is concerned with distributions of 6,551 native-white couples of virtually completed fertility (wife 40-44) according to number of live births. The analysis is carried through for Protestant and for Catholic groups separately by age of wife at marriage, monthly rental value of the dwelling unit, educational attainment, and birth region of the couple.

In the total sample, 18.8 per cent of the wives are childless and almost one-half (46.8 per cent) have one or two children, numbers below the average requirement for population maintenance. About 15 per cent have three children and 20 per cent have four or more.

The trend toward decreasing frequency of the large family is apparent from comparisons of the 1941 data with a somewhat

similar sample previously extracted from the 1910 Census returns for Indianapolis.

By religion, the proportion childless is lowest (14.8 per cent) for the Catholic couples and highest (25.6 per cent) for the Protestant-Catholic mixed marriages. The proportion for the numerically predominant group of Protestant couples is 18.8 per cent, the same as that for the total group. The proportion of Catholic couples with five or more children is 17.1 per cent, as compared with 11.0 per cent for the Protestant couples and Protestant-Catholic mixed marriages.

With advancing age at marriage there is a sharp rise in the proportion of childless couples and an equally striking decline in the proportion with five or more children. Within the limits of the data available, however, this type of relation appears to be more pronounced among the Protestant than among the Catholic couples.

The relationship of family size to rental value and educational attainment is also sharper and somewhat more systematic among Protestant than among Catholic couples. With certain exceptions discussed in the report, however, the distributions exhibit the expected decreasing frequency of the large family with rising rental or educational status within each religious group considered.

At each rental and educational level where the number of Catholic couples is large enough to give a fairly reliable percentage distribution, the Catholic couples surpass the Protestant couples with respect to proportion with five or more children, and to fall below with respect to proportion childless.

In the classification of Protestant couples by birth region of the husband and wife, the "Both South" group is conspicuous for its lowest proportion of childlessness and for its highest proportion of families with five or more children. The average fertility rate of this group of Protestants surpasses that of all Catholics in the present study. Although the highest proportion of childless families

is that observed for the relatively small group of Protestant "Husband North-Wife South" unions, the lowest average fertility rate and the lowest proportion of families with five or more children are those for the numerically important Protestant "Both North" couples.

Erratum

Please make the following correction in Table 1 of Whelpton, P. K. and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. I. Differential Fertility Among 41,498 Native-White Couples in Indianapolis. The Milbank Memorial Fund *Quarterly*, July, 1943, xxi, No. 3, p. 226. (Reprint p.6.):

Change "Husband Catholic-Wife Protestant" to "Husband Protestant-Wife Catholic." Change "Husband Protestant-Wife Catholic" to "Husband Catholic-Wife Protestant."

This erroneous interchange appeared only in the stub of Table 1. The text discussion of these two classes is correct as it stands.